Issued April 1970

SOIL SURVEY
Hitchcock County, Nebraska

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service
In cooperation with
UNIVERSITY OF NEBRASKA
Conservation and Survey Division

Major fieldwork for this soil survey was done in the period 1960–1964. Soil names and descriptions were approved in 1965. Unless otherwise indicated, statements in the publication refer to conditions in the county in 1965. This survey was made cooperatively by the Soil Conservation Service and the Conservation and Survey Division of the University of Nebraska. It is part of the technical assistance furnished to the Hitchcock County Soil and Water Conservation District.

Either enlarged or reduced copies of the soil map in this publication can be made by commercial photographers, or can be purchased, on individual order, from the Cartographic Division, Soil Conservation Service, USDA, Washington, D.C. 20250.

HOW TO USE THIS SOIL SURVEY

THIS SOIL SURVEY of Hitchcock County contains information that can be applied in managing farms and ranches; in selecting sites for roads, ponds, buildings, or other structures; and in determining the suitability of tracts of land for agriculture, industry, and recreation.

Locating Soils

All of the soils of Hitchcock County are shown on the detailed map at the back of this survey. This map consists of many sheets that are made from aerial photographs. Each sheet is numbered to correspond with a number shown on the Index to Map Sheets.

On each sheet of the detailed map, soil areas are outlined and are identified by symbols. All areas marked with the same symbol are the same kind of soil. The soil symbol is inside the area if there is enough room; otherwise, it is outside and a pointer shows where it belongs.

Finding and Using Information

The "Guide to Mapping Units" can be used to find information in the survey. This guide lists all of the soils of the county in alphabetic order by map symbol. It shows the page where each kind of soil is described, and also the page for the capability unit, range site, and windbreak group in which the soil has been placed.

Interpretations not included in this survey can be developed by using information in the text to group the soils according to their suitability or limitations for a particular use. Translucent material can be used as an overlay over the soil map and colored to show soils that have the same limitation or suitability. For example, soils that have a slight limitation for a given use can be colored green, those with a moderate limitation can be colored yellow, and those with a severe limitation can be colored red.

Farmers and those who work with farmers can learn about use and management of the soils from the soil descriptions and from the discussions of the capability units, range sites, and windbreak groups.

Game managers, sportsmen, and others concerned with wildlife will find information about soils and wildlife in the section "Management of the Soils for Wildlife and Recreation."

Ranchers and others interested in range can find, under "Management of the Soils for Range," groupings of the soils according to their suitability for range.

Engineers and builders will find, under "Management of the Soils for Engineering," tables that contain test data, estimates of soil properties, and information about soil features that affect engineering practices and designs.

Scientists and others can read about how the soils were formed and how they are classified in the section "Formation and Classification of the soils."

Newcomers in Hitchcock County may be especially interested in the section "General Soil Map," where broad patterns of soils are described. They may also be interested in the section "General Nature of the County."

Cover: Typical landscape of Hitchcock County. Keith silt loam on nearly level terraces in center has been stripcropped with wheat, milo, and summer fallow. Colby silt loam in background has native grass cover. Windbreak in foreground protects farmstead and feedlot from cold winds in winter.

U.S. GOVERNMENT PRINTING OFFICE: 1970

For sale by the Superintendent of Documents, U.S. Government Printing Office
Washington, D.C. 20402

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Issued—1970

SOIL SURVEY OF HITCHCOCK COUNTY, NEBRASKA

BY RONALD R. HOPPES, NORMAN W. HUBER, HOWARD E. SAUTTER, AND MAX A. SHERWOOD, SOIL CONSERVATION SERVICE

UNITED STATES DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE, IN COOPERATION WITH THE UNIVERSITY OF NEBRASKA CONSERVATION AND SURVEY DIVISION

HITCHCOCK COUNTY is in southwest Nebraska, adjoining Kansas (fig. 1). Trenton is the county seat. The county is rectangular in shape and is about 30 miles from east to west and 24 miles from north to south. The total area is 722 square miles, or 462,080 acres. The average elevation is 2,850 feet.

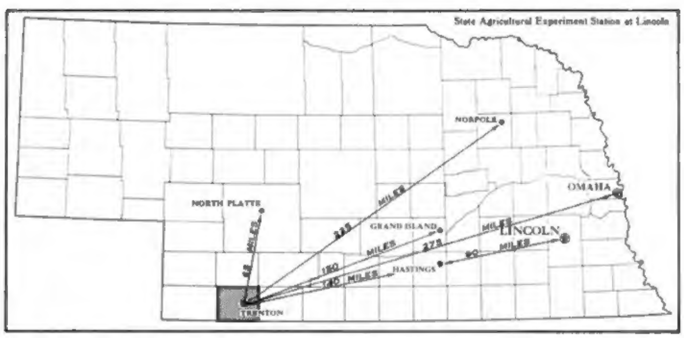

Figure 1.—**Location of Hitchcock County in Nebraska.**

Farming is the principal enterprise. Wheat, corn, and grain sorghum are the major crops. They are grown under both dryland and irrigated farming. Wheat is the main cash crop. A considerable part of the grain and forage is fed to livestock in the county. Nearly half of the county is in native grass range. Raising beef cattle is the major livestock enterprise.

How This Survey Was Made

Soil scientists made this survey to learn what kinds of soils are in Hitchcock County, where they are located, and how they can be used. They went into the county knowing they likely would find many soils they had already seen, and perhaps some they had not. As they traveled over the county, they observed steepness, length, and shape of slopes; size and speed of streams; kinds of native plants or crops; kinds of rock; and many facts about the soils. They dug or bored many holes to expose soil profiles. A profile is the sequence of natural layers, or horizons, in a soil; it extends from the surface down to the rock material that has not been changed much by leaching or by roots of plants.

The soil scientists made comparisons among the profiles they studied, and they compared these profiles with those in counties nearby and in places more distant. They classified and named the soils according to uniform procedures. To use this information efficiently, it is necessary to know the kinds of groupings most used in a local soil classification.

Soils that have profiles almost alike make up a soil series. Except for different texture in the surface layer, the major horizons of all the soils of one series are similar in thickness, arrangement, and other important characteristics. Each soil series is named for a town or other geographic feature near the place where a soil of that series was first observed and mapped. Anselmo and Bayard, for example, are the names of two soil series. All the soils in the United States having the same series name are essentially alike in those characteristics that affect their behavior in the natural, undisturbed landscape. Soils of one series can differ somewhat in texture of the surface soil and in slope, stoniness, or some other characteristic that affects use of the soils by man.

Many soil series contain soils that differ in texture of their surface layer. According to such differences in texture, separations called soil types are made. Within a series, all the soils having a surface layer of the same texture belong to one soil type. Anselmo fine sandy loam and Anselmo loamy fine sand are two soil types in the Anselmo series. The difference in texture of their surface layer is apparent from their names.

Some soil types vary so much in slope, degree of erosion, number and size of stones, or some other feature affecting their use, that practical suggestions about their management could not be made if they were shown on the soil map as one unit. Such soil types are divided into phases. The name of a soil phase indicates a feature that effects management. For example, Anselmo fine sandy loam, 0 to 1 percent slopes, is one phase of Anselmo fine sandy loam, a soil type that has a slope range of 0 to 9 percent.

After a guide for classifying and naming the soils had been worked out, the soil scientists drew boundaries of the individual soils on aerial photographs. These photographs show woodlands, buildings, field borders, trees, and other details that help in drawing boundaries accurately. The soil map at the back of this publication was prepared from aerial photographs.

The areas shown on a soil map are called mapping units. On most maps detailed enough to be useful in planning management of farms and fields, a mapping unit is nearly equivalent to a soil type or a phase of a soil type. It is not exactly equivalent, because it is not practical to show on such a map all the small, scattered bits of soil of some other kind that have been seen within an area that is dominantly of a recognized soil type or soil phase.

In preparing some detailed maps, the soil scientists have a problem of delineating areas where different kinds of soils are so intermingled and occur in individual areas of such small size that it is not practical to show them separately on the map. They show such a mixture of soils as one mapping unit and call it a soil complex. Ordinarily, a soil complex is named for the major kinds of soils in it, for example, Dwyer-Valentine loamy fine sands, 3 to 17 percent slopes.

Another kind of mapping unit is the undifferentiated group, which consists of two or more soils that may occur together without regularity in pattern or relative proportion. The individual tracts of the component soils could be shown separately on the map, but the differences between the soils are so slight that the separation is not important for the objectives of the soil survey. An example is Keith and Goshen silt loams, 0 to 1 percent slopes.

Most surveys include areas where the soil material is so rocky, so shallow, or so frequently worked by wind and water that it cannot be classified by soil series. These areas are shown on the map like other mapping units, but are given descriptive names, such as Rough broken land, loess, or Sandy alluvial land, and are called land types.

While a soil survey is in progress, samples of soils are taken, as needed, for laboratory measurements and for engineering tests. Laboratory data from the same kinds of soils in other places are assembled. Data on yields of crops under defined practices are assembled from farm records and from field or plot experiments on the same kinds of soils. Yields under defined management are predicted for all the soils.

But only part of a soil survey is done when the soils have been named, described, and delineated on the map and the laboratory data and yield data have been assembled. The mass of detailed information then needs to be organized in such a way that it is readily useful to different groups of readers, among them farmers, ranchers, engineers, and homeowners. Grouping soils that are similar in suitability for each specified use is the method of organization commonly used in the soil survey. On the basis of the yield and practice tables and other data, the soil scientists set up trial groups. They test these groups by further study and by consultation with farmers, agronomists, engineers, and others, then adjust the groups according to the results of their studies and consultation. Thus, the groups that are finally evolved reflect up-to-date knowledge of the soils and their behavior under present methods of use and management.

General Soil Map

The general soil map at the back of this survey shows, in color, the soil associations in Hitchcock County. A soil association is a landscape that has a distinctive proportional pattern of soils. It normally consists of one or more major soils and at least one minor soil, and it is named for the major soils. The soils in one association may occur in another, but in a different pattern.

A map showing soil associations is useful to people who want a general idea of the soils in a county, who want to compare different parts of a county, or who want to know the location of large tracts that are suitable for a certain kind of farming or other land use. Such a map is not suitable for planning the management of a farm or field, because the soils in any one association ordinarily differ in slope, depth, stoniness, drainage, and other characteristics that affect management.

The five soil associations in Hitchcock County are described in this section. The terms for texture used in the titles of the associations apply to the surface layer. For example, in the title for association 1, the word "silty" refers to the texture of the surface layer.

1. Keith-Goshen association

Silty soils on tablelands

This association consists of nearly level to gently sloping soils on uplands (fig. 2). It covers an area of 200,000 acres, or 43 percent of the county.

Keith soils make up 82 percent of this association, Goshen soils 17 percent, and Hord and Scott soils 1 percent.

Keith soils occur as nearly level to gently sloping areas throughout the uplands. Goshen soils occur as nearly level areas, generally at the base of very gentle slopes. Hord soils occur as nearly level areas in swales or drainageways, and Scott soils are in basinlike depressions. All of these soils formed in deep Peorian loess.

Except for the Scott soils, all of this association is cultivated. Winter wheat, corn, and grain sorghum are the chief crops.

2. *Colby association*

Silty soils on canyon walls and hills

This association consists of gently sloping to steep soils in canyons and on hills along drainageways (fig. 3). It covers an area of about 193,000 acres, or 42 percent of the county.

Colby soils make up about 74 percent of this association, Ulysses soils 14 percent, and Rough broken land 12 percent.

Colby soils are steep and occupy the slightly broken canyon slopes. These soils are deep and have a thin, slightly darkened surface layer grading to a light-colored silty substratum that contains lime.

Ulysses soils have gentle to moderate slopes and occupy smooth hillsides. Under native grass, lime is at a depth of 6 to 12 inches, but in cultivated areas it is at the surface.

Rough broken land is steep and occurs on the canyon walls where soil slipping is evident. Most of this land type is in loess. Small areas of it are in caliche.

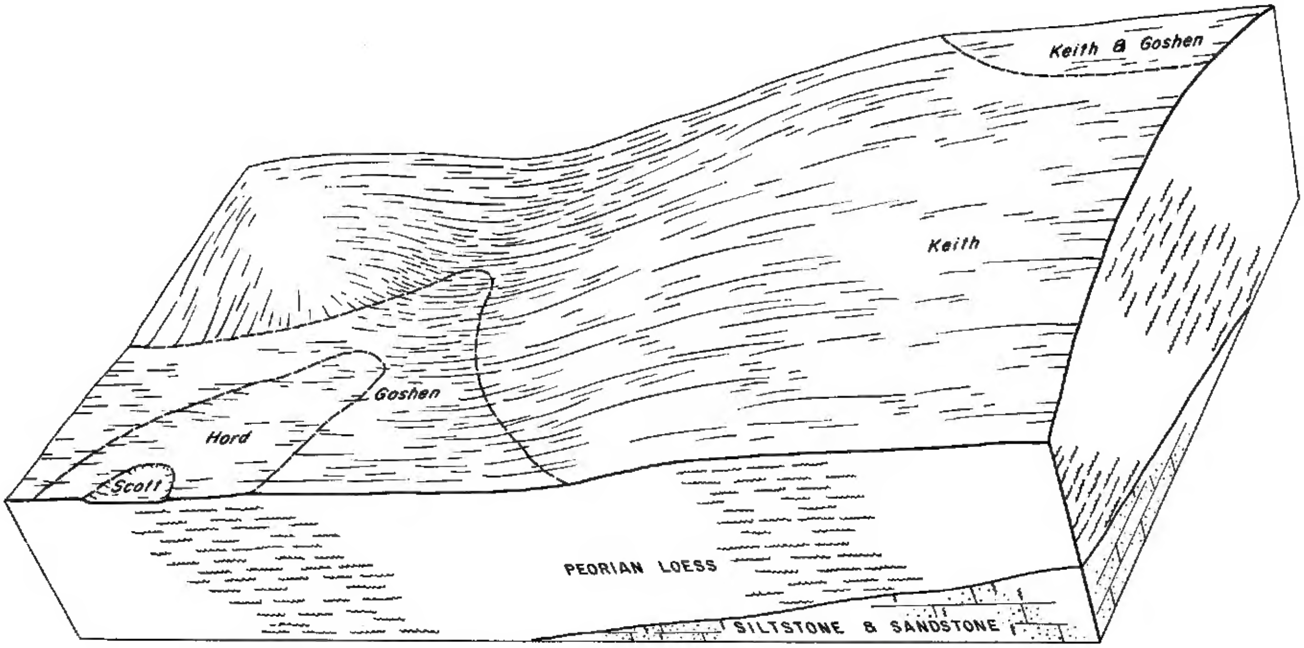

***Figure 2.*—Typical pattern of soils and underlying material in association 1.**

Because of the slopes, these soils are better suited to native pasture than to other uses. Little bluestem, blue grama, side-oats grama, and western wheatgrass are the main pasture plants. The smoother, more gently sloping areas are cultivated, but erosion is a hazard and many of these areas are being returned to native grass.

3. *Valentine-Anselmo association*

Sandy soils on uplands

This association is made up of undulating to hummocky soils that formed in eolian sand and silt (fig. 4). Most of it is in the west-central part of the county, south of the Republican River. The total acreage is about 3 percent of the county.

Valentine soils make up about 48 percent of this association, Anselmo soils 41 percent, and Dwyer soils 11 percent.

The very sandy Valentine soils are hummocky and dunelike. The moderately sandy Anselmo soils have smoother slopes and are deep. Dwyer soils occur as lower hummocky areas surrounding Valentine soils; they have a thicker, finer textured solum than Valentine soils.

Anselmo soils are used for corn, grain sorghum, and alfalfa. Valentine and Dwyer soils are in native pasture

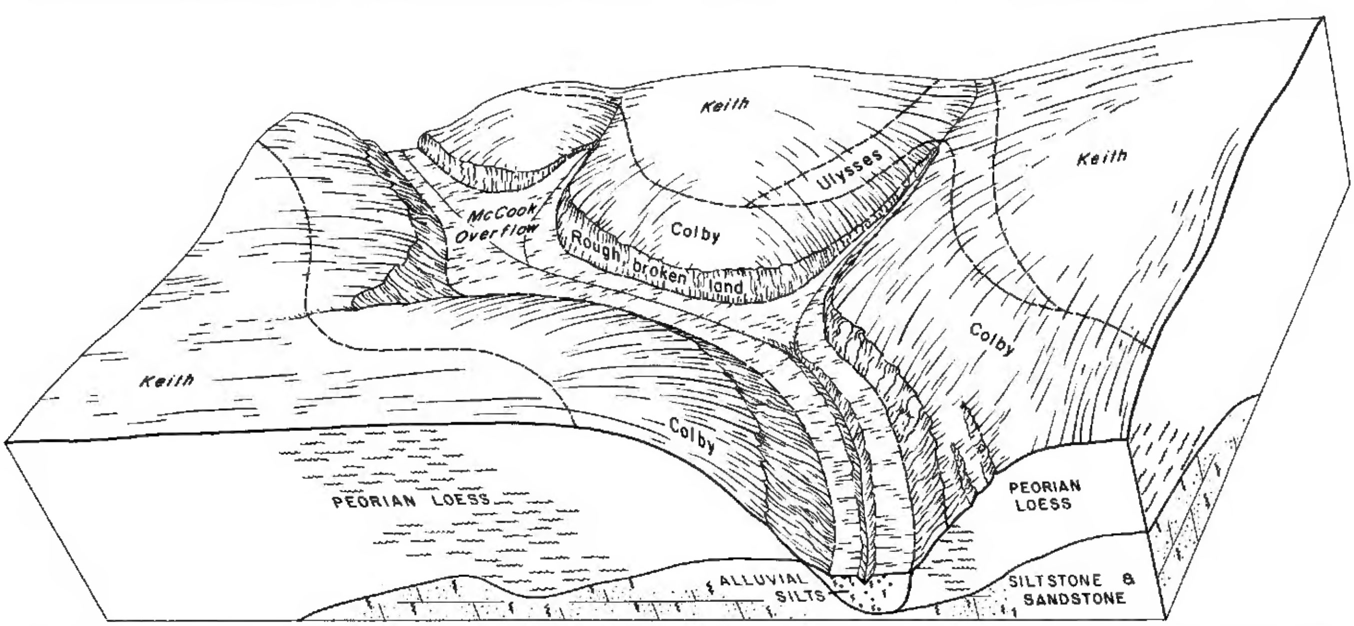

***Figure 3.*—Typical pattern of soils and underlying material in association 2, and adjoining areas of Keith and McCook soils.**

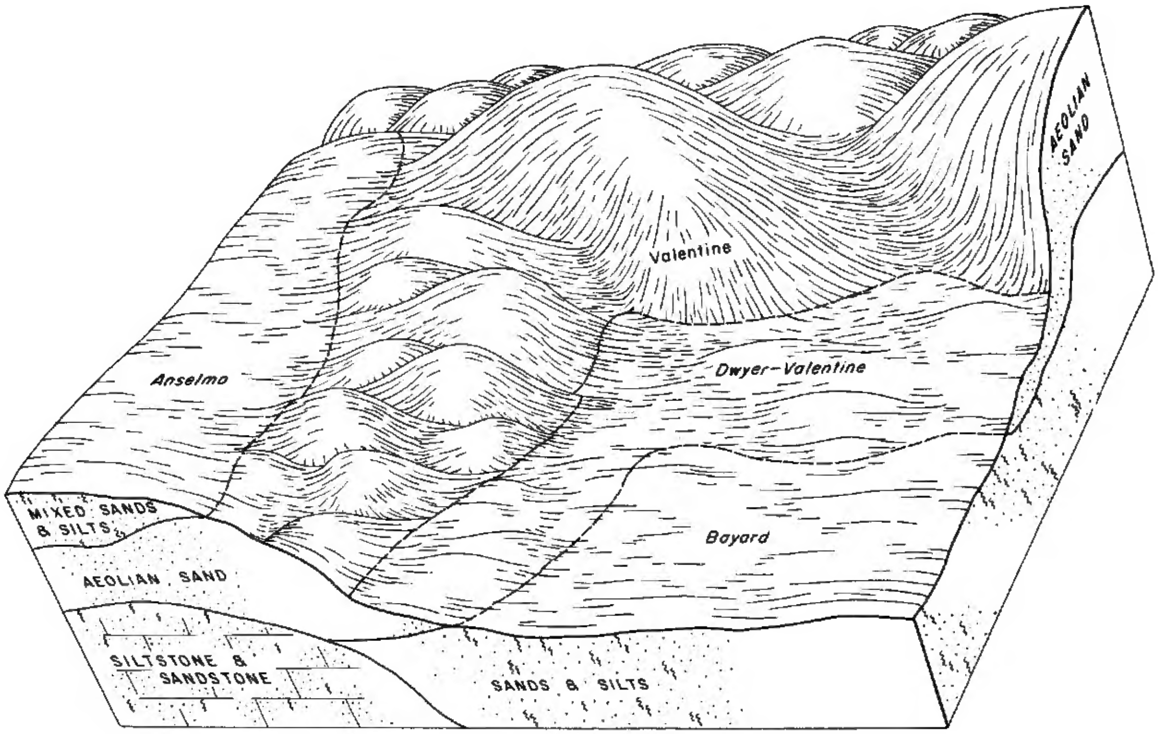

Figure 4.—**Typical pattern of soils and underlying material in association 3.**

consisting mostly of switchgrass, big bluestem, sand bluestem, prairie sandreed, needle-and-thread, and blue grama.

Wind erosion is a serious hazard on these sandy soils. Many areas that are difficult to manage under cultivation are being seeded to native grasses.

4. Bridgeport-McCook-Duroc association

Loamy soils on foot slopes, terraces, and high bottom lands

Nearly level to gently sloping soils on colluvial-alluvial slopes, on stream terraces, and on well-drained bottom lands make up this association (fig 5). The total acreage is about 8 percent of the county.

Bridgeport soils make up about 54 percent of this association, McCook soils 22 percent, Duroc soils 11 percent, and Bayard and Glenberg soils 13 percent.

Bridgeport soils are at the base of loessal slopes and on colluvial fans. They are deep, light-colored, calcareous soils.

McCook soils are deep, moderately dark colored, well-drained soils on bottom lands. They are generally silty, but in a few small areas they have a moderately sandy surface layer.

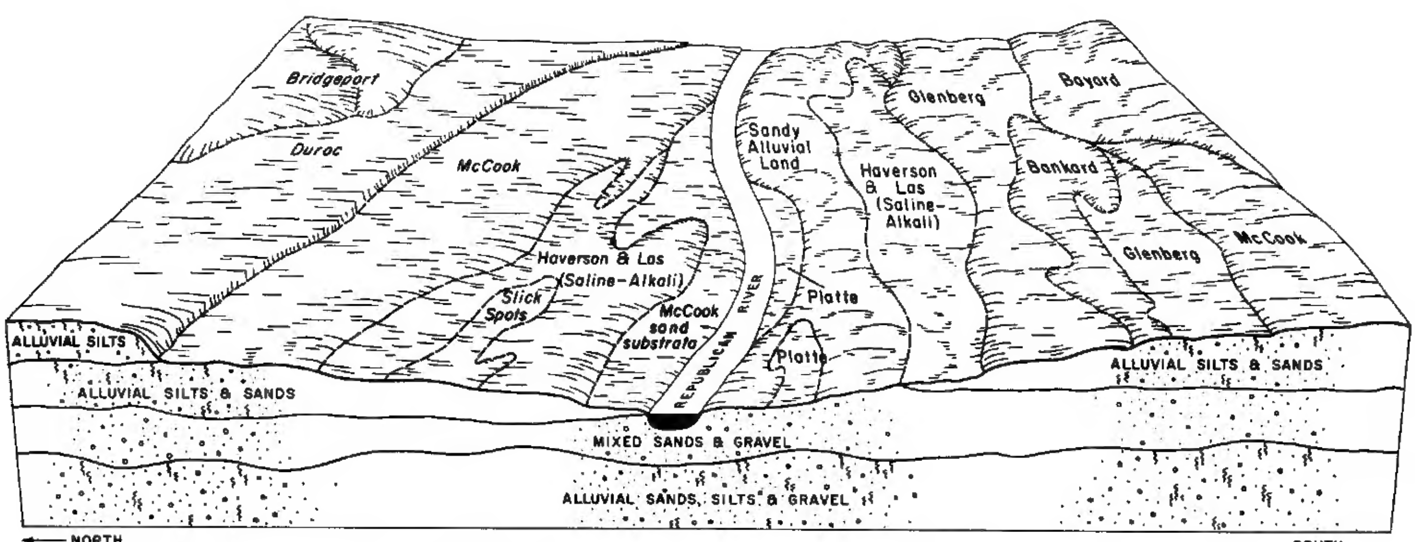

Figure 5.—**Typical pattern of soils and underlying material in associations 4 and 5.**

Duroc soils are on terraces in the eastern part of the county, mainly along the Republican River. These soils formed in wind-worked old alluvium. They are deep and dark colored and have a weakly developed solum. The underlying alluvium is light colored and calcareous.

These soils are well suited to cultivation. Corn and grain sorghum are the main crops. A large part of the acreage is irrigated. Most of the water for irrigation comes from the Upper Meeker and Culbertson Canals, but a good supply can be obtained from irrigation wells.

5. *Sandy alluvial land-Haverson-Las association*

Sandy and loamy soils on river flood plains

This soil association is on the flood plains of the Republican River (see fig. 5). The total acreage is about 4 percent of the county.

Sandy alluvial land makes up about 50 percent of the association, Haverson and Las soils 25 percent, and Platte, Bankard, and other soils 25 percent.

Sandy alluvial land consists of mounds and channels of recently deposited silt and sand that vary in depth and coarseness and have little soil development.

Haverson and Las soils are somewhat poorly drained and have a silty to moderately sandy surface layer and a silty to clayey subsoil. They are strongly to very strongly alkaline but show only a slight concentration of salt.

Sandy alluvial land is used for grazing, woodland, wildlife, and engineering. Haverson and Las soils, although alkaline, are cultivated. They are suited to crops that are moderately salt tolerant.

Flooding, alkalinity, and wind and water erosion are the main limitations of these soils.

Descriptions of the Soils

In this section the soils of Hitchcock County are described in detail. The procedure is to describe first the soil series and then the mapping units in that series. Thus, to get full information on any one mapping unit, it is necessary to read both the description of that unit and the description of the soil series to which the unit belongs.

The description of the soil series includes a description of a profile that is considered representative of all the soils of the series. If the profile of a given mapping unit differs from this typical profile, the differences are stated in the description of the mapping unit, unless they are apparent from the name of the mapping unit.

Broken alluvial land, Rough broken land, caliche, and other land types do not belong to a soil series. Nevertheless, they are listed in alphabetic order along with the soil series.

The capability unit, range site, and windbreak group to which each soil is assigned are named at the end of each soil description. The "Guide to Mapping Units" shows where the descriptions of these groupings are to be found in this publication. Table 1 shows the acreage and proportionate extent of each soil.

Where references are made to the use of fertilizer, it is to be assumed that the needs have been determined by soil tests.

TABLE 1.—*Approximate acreage and proportionate extent of the soils*

Soil	Area	Extent
	Acres	*Percent*
Anselmo fine sandy loam, 0 to 1 percent slopes	204	(1)
Anselmo fine sandy loam, 1 to 3 percent slopes	2,075	0.5
Anselmo fine sandy loam, 3 to 5 percent slopes	1,940	.4
Anselmo fine sandy loam, 5 to 9 percent slopes	505	.1
Anselmo loamy fine sand, 0 to 3 percent slopes	130	(1)
Anselmo loamy fine sand, 3 to 7 percent slopes	310	.1
Bankard loamy fine sand	787	.2
Bayard fine sandy loam, 0 to 1 percent slopes	579	.1
Bayard fine sandy loam, 1 to 3 percent slopes	1,039	.2
Bayard loam, 0 to 1 percent slopes	400	.1
Bayard loamy fine sand, hummocky	335	.1
Bridgeport silt loam, 0 to 1 percent slopes	8,694	1.9
Bridgeport silt loam, 1 to 3 percent slopes	7,117	1.5
Bridgeport silt loam, 3 to 7 percent slopes	2,909	.6
Broken alluvial land	3,890	.8
Colby silt loam, 7 to 9 percent slopes	455	.1
Colby silt loam, 9 to 30 percent slopes	142,932	31.0
Duroc silt loam, terrace, 0 to 1 percent slopes	3,310	.7
Duroc silt loam, terrace, 1 to 3 percent slopes	400	.1
Dwyer-Valentine loamy fine sands, 3 to 17 percent slopes	1,360	.3
Glenberg fine sandy loam	1,460	.3
Glenberg fine sandy loam, saline-alkali	565	.1
Goshen silt loam, 0 to 1 percent slopes	9,200	2.0
Haverson fine sandy loam	203	(1)
Haverson and Las loams, saline-alkali	2,297	.5
Hord silt loam, 0 to 1 percent slopes	1,005	.2
Keith silt loam, 1 to 3 percent slopes	126,185	27.3
Keith silt loam, 1 to 3 percent slopes, eroded	13,750	3.0
Keith silt loam, 3 to 7 percent slopes	1,767	.4
Keith silt loam, 3 to 7 percent slopes, eroded	14,476	3.1
Keith and Goshen silt loams, 0 to 1 percent slopes	33,485	7.2
McCook loam	3,790	.8
McCook loam, overflow	3,080	.7
McCook loam, sand substratum variant	750	.2
Platte loam	1,070	.2
Rough broken land, caliche	1,880	.4
Rough broken land, loess	20,103	4.4
Sandy alluvial land	5,413	1.2
Scott silt loam	394	.1
Slickspots	135	(1)
Ulysses silt loam, 3 to 7 percent slopes, eroded	10,449	2.3
Ulysses silt loam, 7 to 9 percent slopes	2,572	.6
Ulysses and Colby silt loams, 7 to 9 percent slopes, eroded	14,028	3.0
Valentine fine sand, rolling	5,970	1.3
Water area	8,605	1.9
Gravel pits	77	(1)
Total	462,080	100.0

[1] Less than 0.05 percent.

Many of the terms used in describing the soil series and mapping units are defined in the Glossary, and others are defined in the section "How This Survey Was Made."

Anselmo Series

The Anselmo series consists of moderately coarse textured to coarse textured, nearly level to moderately sloping soils on uplands just south of the Republican River. These soils formed in windblown sand. They are characterized by low, rounded hummocks.

Anselmo soils are very friable and are easily tilled. They have moderately rapid permeability and are well

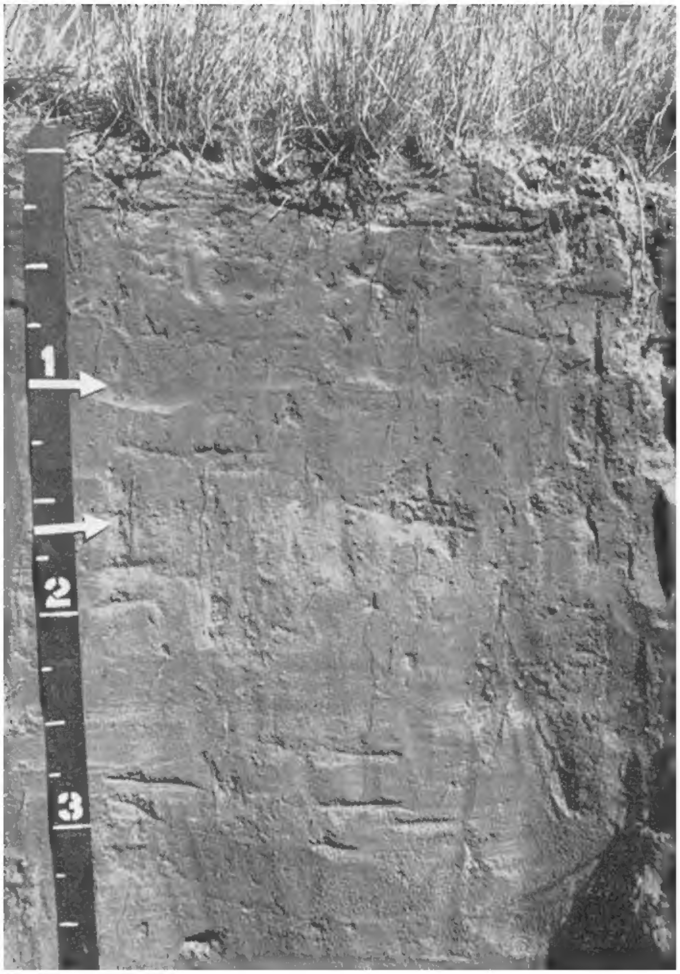

Figure 6.—**Profile of Anselmo fine sandy loam. Pointers show boundaries between surface layer, subsoil, and substratum.**

drained. They are productive, but special management is needed to control wind erosion and conserve moisture. These soils are suited to corn and sorghum and to wheat, rye, barley, and other close-growing crops.

A typical profile (fig. 6) has a surface layer of grayish-brown fine sandy loam about 17 inches thick. Next is a layer of grayish-brown fine sandy loam, about 10 inches thick, that has weak, subangular blocky structure. The underlying material is light brownish-gray fine sandy loam over pale-brown to light-gray loamy fine sand. Calcium carbonate occurs in the underlying material.

Typical profile, in a cultivated field having a slope of about 2 percent, 100 feet north and 0.2 mile west of the southeast corner of sec. 26, T. 2 N., R. 35 W.:

Ap—0 to 6 inches, grayish-brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) when moist; weak, fine, granular structure; soft when dry, very friable when moist; noncalcareous; abrupt, smooth boundary.

A1—6 to 17 inches, grayish-brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) when moist; weak, coarse and medium, subangular blocky structure; soft when dry, very friable when moist; noncalcareous; clear, wavy boundary.

AC—17 to 27 inches, grayish-brown (10YR 5/2) fine sandy loam, dark grayish-brown (10YR 4/2) when moist; weak, medium and fine, subangular blocky structure; soft when dry, very friable when moist; noncalcareous; clear, wavy boundary.

C1—27 to 34 inches, light brownish-gray (10YR 6/2) fine sandy loam, dark grayish brown (10YR 4/2) when moist; weak, medium and fine, subangular blocky structure; soft when dry, very friable when moist; calcareous and slightly effervescent, with abundant disseminated lime; gradual, wavy boundary.

C2—34 to 42 inches, pale-brown (10YR 6/3) loamy fine sand, dark brown or brown (10YR 4/3) when moist; weak, fine, granular structure; loose when dry, very friable when moist; calcareous and slightly effervescent, with abundant disseminated lime; gradual, wavy boundary.

C3—42 to 60 inches, light-gray (10YR 7/2) loamy fine sand, grayish brown (10YR 5/2) when moist; single grain; loose when dry, loose when moist; calcareous and strongly effervescent.

The thickness of the surface layer ranges from 7 inches in the steeper areas to 20 inches in the nearly level areas. In some places the surface layer is loamy fine sand or loamy sand to a depth of about 15 inches. Near the breaks to the valley of the Republican River, calcium carbonate is within 6 inches of the surface in some places. Silty loess is the underlying material in many areas of transition between the sandy and silty soils.

Anselmo soils occur with Keith and Bayard soils. They are coarser textured and less strongly developed than Keith soils. They differ from Bayard soils in being free of calcium carbonate in the surface layer. They are higher in organic-matter content and finer textured than Valentine soils.

Anselmo fine sandy loam, 0 to 1 percent slopes (An).—This soil is on uplands. It is subject to wind erosion if not protected. The moisture-fertility balance is better than in other soils of this series.

The profile is slightly thicker than the one described for the series.

Nearly all the acreage is cultivated. All crops grown in the county can be grown on this soil, but corn and sorghum are better suited than others. Including a legume in the cropping system increases the organic-matter content and improves tilth. (Capability unit IIe–3 dryland, and IIe–3 irrigated; Sandy range site; Sandy windbreak group)

Anselmo fine sandy loam, 1 to 3 percent slopes (AnA).—This soil is on uplands. Its profile is the same as the one described as typical of the series.

Nearly all the acreage is cultivated, although special management is needed to control wind erosion and conserve moisture. Corn and sorghum are suitable crops. (Capability unit IIIe–3 dryland, and IIe–3 irrigated; Sandy range site; Sandy windbreak group)

Anselmo fine sandy loam, 3 to 5 percent slopes (AnB).—This soil is on uplands. It is subject to wind and water erosion.

The profile is similar to the one described for the series, but because of erosion, the surface layer is only about 13 inches thick. In a few places it is loamy fine sand. Calcium carbonate is at a depth of 18 to 24 inches.

Corn and sorghum are the chief crops. Close-growing crops provide better cover against wind erosion than row crops. Emergency tillage and a cover crop are necessary if a crop has failed. (Capability unit IIIe–3 dryland, and IIIe–3 irrigated; Sandy range site; Sandy windbreak group)

Anselmo fine sandy loam, 5 to 9 percent slopes (AnC).—This soil is subject to wind and water erosion. In some areas there are rills, ditches, or blown-out sandy spots.

The profile is similar to the one described as typical of the series, but the uppermost 2 or 3 inches of the surface layer is loamy fine sand in places. Calcium carbonate is generally leached to a depth of more than 2 feet.

Most of the acreage is cultivated. Wheat, sorghum, and other close-growing crops are suitable. Fertility is low, and the water-holding capacity is moderately low. Erosion can be held to a minimum by stubble mulching and by stripcropping small grain with summer fallow. Including grass or a grass-legume mixture in the cropping system helps to control erosion, increases fertility, and improves the water-holding capacity. (Capability unit IVe-3 dryland, and IVe-3 irrigated; Sandy range site; Sandy windbreak group)

Anselmo loamy fine sand, 0 to 3 percent slopes (AoAW).—As a result of wind erosion, the surface layer of this soil is only 4 to 8 inches thick. Further wind erosion is a severe hazard.

If this soil is cultivated, careful management is needed. Close-growing crops are better suited than row crops. Including a legume in the cropping system increases the organic-matter content and improves tilth. (Capability unit IIIe-5 dryland, and IIIe-5 irrigated; Sandy range site; Sandy windbreak group)

Anselmo loamy fine sand, 3 to 7 percent slopes (AoBW).—This soil is subject to severe wind erosion and has many blowouts.

The profile is similar to the one described for the series, but the surface layer is coarser textured and lighter colored and is no more than 17 inches thick. Calcium carbonate is at a depth of 14 to 20 inches.

Close-growing crops are better suited than row crops. Including a legume or a grass-legume mixture in the cropping system helps to reduce the erosion hazard. (Capability unit IVe-5 dryland, and IVe-5 irrigated; Sandy range site; Sandy windbreak group)

Bankard Series

The Bankard series consists of deep, light-colored, sandy soils that developed in alluvium under sandgrass and sagebrush. These are nearly level to very gently sloping soils on ridges, hummocks, and old meander bars along the Republican River and the Frenchman River.

The surface layer becomes loose when tilled and is subject to wind erosion. Permeability is rapid, and the water-holding capacity is low. Fertility is low, and the organic-matter content is low.

A typical profile has a 6-inch surface layer of grayish-brown loamy fine sand. A transitional layer of light brownish-gray loamy fine sand extends to a depth of about 14 inches. The substratum is light-gray, layered alluvium that is generally sand, but ranges from loam to sand and gravel in texture. Calcium carbonate occurs at a depth of about 6 inches. The water table is within 8 feet of the surface.

Typical profile, in native grass pasture having a slope of about 2 percent, 0.2 mile north and 0.1 mile west of the southeast corner of sec. 27, T. 3 N., R. 32 W.:

A 0 to 6 inches, grayish-brown (10YR 5.5/2) loamy fine sand, very dark grayish brown to dark grayish brown (10YR 3.5/2) when moist; weak, fine, granular structure; soft when dry, very friable when moist; noncalcareous; clear, smooth boundary.

AC—6 to 14 inches, light brownish-gray (10YR 6.5/2) loamy fine sand, dark grayish brown (10YR 4/2) when moist; weak, fine, granular structure breaking to single grain; loose when dry, loose when moist; calcareous and slightly effervescent; clear, smooth boundary.

C1—14 to 42 inches, light-gray (10YR 7/2) fine sand, grayish brown (10YR 5/2) when moist; weak, coarse, prismatic structure breaking to single grain; loose when dry; loose when moist; calcareous and slightly effervescent; abrupt, smooth boundary.

IIC2—42 to 45 inches, light-gray (10YR 7/2) loam, grayish brown (10YR 5/2) when moist; weak, thin, platy structure; soft when dry, very friable when moist; calcareous and strongly effervescent; abrupt, smooth boundary.

IIIC3—45 to 50 inches, light-gray (10YR 7/2) sand, grayish brown (10YR 5/2) when moist; single grain; loose when dry, loose when moist; calcareous and slightly effervescent; clear, smooth boundary.

IIIC4—50 to 60 inches, light-gray (10YR 7/2) sand and gravel, grayish brown (10YR 5/2) when moist; single grain; loose when dry, loose when moist; calcareous and slightly effervescent.

The surface layer ranges from 5 to 10 inches in thickness. The substratum is generally sand, but it contains thin layers of loamy material in places. The depth to calcium carbonate is generally less than 20 inches.

Bankard soils are sandier than Glenberg soils.

Bankard loamy fine sand (0 to 2 percent slopes) (BcA).—This soil is used mainly for native pasture, although some wheat, rye, barley, and forage sorghum are grown. Crops respond to nitrogen, phosphorus, and trace elements. (Capability unit IIIe-5 dryland, and IIIe-5 irrigated; Sandy Lowland range site; Sandy windbreak group)

Bayard Series

The Bayard series consists of nearly level to gently sloping soils that are deep, well drained, and medium textured to coarse textured. These soils formed in recent colluvial-alluvial deposits, under grass. They are on bottom lands and on terraces near the base of upland slopes near the Republican River and the Frenchman River.

Bayard soils are medium in natural fertility. They have slow runoff and moderately rapid permeability. They are susceptible to wind erosion if not protected. They have moderately low water-holding capacity and release moisture readily to plants.

These soils are suited to all crops grown in the county. Most of the acreage is cultivated.

A typical profile has a surface layer of grayish-brown fine sandy loam about 14 inches thick. Below this is a transitional layer of light brownish-gray, granular fine sandy loam about 13 inches thick. The underlying material is light-gray, single-grain fine sand. The profile is calcareous at or very near the surface.

Typical profile, in a cultivated field having a slope of 1.25 percent, 200 feet east and 100 feet south of the northwest corner of sec. 12, T. 2 N., R. 33 W.:

Ap—0 to 6 inches, grayish-brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) when moist; weak, fine, granular structure; loose when

dry, very friable when moist; calcareous and slightly effervescent; abrupt, smooth boundary.

A12—6 to 14 inches, grayish-brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) when moist; weak, fine, granular structure; loose when dry, very friable when moist; calcareous and slightly effervescent; clear, smooth boundary.

AC—14 to 27 inches, light brownish-gray (10YR 6/2) fine sandy loam, dark grayish brown (10YR 4/2) when moist; weak, fine, granular structure; loose when dry, very friable when moist; calcareous and strongly effervescent; clear, smooth boundary.

C—27 to 48 inches, light-gray (10YR 7/2) fine sand, grayish brown (10YR 5/2) when moist; single grain; loose when dry, loose when moist; calcareous and strongly effervescent.

The surface layer ranges from 5 to 14 inches in thickness and from grayish brown to light brownish gray in color. In some eroded areas it is loamy fine sand, and in some it is loam. Calcium carbonate is at a depth of 8 to 12 inches where the surface layer is loamy fine sand. A buried layer at a depth of 1 foot to 3 feet is common.

Bayard soils are sandier throughout the profile than associated Bridgeport soils. They are similar to Glenberg soils, which are on bottom lands, but Bayard soils have a darker colored surface layer and are in higher positions.

Bayard fine sandy loam, 0 to 1 percent slopes (Bf).—Most of this soil is cultivated. Among the suitable crops are sorghum and corn and wheat, rye, and other close-growing, high-residue crops. Including a high-residue crop in the cropping system is a means of controlling wind erosion and increasing the organic-matter content. The response to fertilizer is good. (Capability unit IIe–3 dryland, and IIe–3 irrigated; Sandy range site; Sandy windbreak group)

Bayard fine sandy loam, 1 to 3 percent slopes (BfA).—This soil has the profile described as typical of the series.

This soil is suited to all crops grown in the county, and most of it is cultivated. Wind erosion can be controlled by stubble mulching, fertilizing, and including close-growing crops in the cropping system. (Capability unit IIIe–3 dryland, and IIe–3 irrigated; Sandy range site; Sandy windbreak group)

Bayard loam, 0 to 1 percent slopes (Bw).—This soil is on bottom lands along the Republican River and the Frenchman River. The profile is similar to the one described for the series, but the surface layer is loam. The substratum shows some evidence of poor drainage, but drainage has been improved in recent years, and at present there are no drainage limitations.

This soil is productive and easily tilled. It is used mainly for corn, wheat, sorghum, and alfalfa. (Capability unit I–1 dryland, and I–1 irrigated; Silty range site; Silty to Clayey windbreak group)

Bayard loamy fine sand, hummocky (1 to 3 percent slopes) (BfA2).—This soil is slightly undulating or wavy because wind has scoured soil material from open places and deposited it in other places. In color and horizon arrangement the profile is similar to the one described for the series, but the surface layer is loamy fine sand only 6 to 8 inches thick. Also, calcium carbonate has been leached to a depth of 8 to 12 inches.

Much of the acreage is cultivated. Because of the low organic-matter content and low fertility, crops that leave a large amount of residue are beneficial. (Capability unit IIIe–5 dryland, and IIIe–5 irrigated; Sandy range site; Sandy windbreak group)

Bridgeport Series

The Bridgeport series consists of deep, medium-textured, well-drained soils that formed in colluvium and alluvium. These soils formed under native grass, mostly blue grama, little bluestem, and western wheatgrass. They are nearly level to gently sloping soils on foot slopes and near the mouth of small tributaries of the larger streams. Calcareous loess and local wash are the sources of the alluvium and colluvium.

Surface runoff is slow to moderate, internal drainage is medium, and permeability is moderate. The water-holding capacity is moderate. Natural fertility is medium. Control of water erosion is a problem in some unprotected areas that receive runoff from higher areas. Wind erosion is a hazard in unprotected areas.

These soils are well suited to irrigation and to all crops grown in the county. Much of the acreage is cultivated. Corn and grain sorghum are the principal crops.

A typical profile has a 15-inch surface layer of grayish-brown silt loam over light brownish-gray silt loam. Below this is a transitional layer of light brownish-gray, weak prismatic silt loam. The underlying material, below a depth of 27 inches, is light-gray massive silt loam. The entire profile is calcareous.

Typical profile, in a cultivated field having a slope of less than 1 percent, 0.1 mile south and 100 feet west of the northeast corner of sec. 10, T. 3 N., R. 32 W.:

Ap—0 to 7 inches, grayish-brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) when moist; weak, fine, granular structure; soft when dry, very friable when moist; calcareous and slightly effervescent; abrupt, smooth boundary.

A1—7 to 15 inches, light brownish-gray (10YR 6/2) silt loam, very dark grayish brown to dark grayish brown (10YR 3.5/2) when moist; weak, coarse, prismatic structure; soft when dry, very friable when moist; calcareous and slightly effervescent; gradual, wavy boundary.

AC—15 to 27 inches, light brownish-gray (10YR 6/2) silt loam, dark grayish brown (10YR 4/2) when moist; weak, coarse, prismatic structure; soft when dry, very friable when moist; calcareous and slightly effervescent; gradual, wavy boundary.

C—27 to 60 inches, light-gray (10YR 7/2) silt loam, grayish brown (10YR 5/2) when moist; massive; soft when dry, very friable when moist; calcareous and strongly effervescent.

The A horizon ranges from 6 to 16 inches in thickness and from gray to grayish brown and light brownish gray in color. The AC horizon, or transitional layer, ranges from light brownish gray to grayish brown in color and from 8 to 12 inches in thickness. The underlying colluvium is light brownish gray to light gray. This material is generally massive but in some places has a weak, coarse, prismatic structure in the upper part. The profile is calcareous within 6 inches of the surface.

Bridgeport soils differ from Duroc soils in having less organic staining in the lower part of the surface layer, in lacking a B horizon, and in having calcium carbonate closer to the surface. They differ from Keith soils in having calcium carbonate closer to the surface, and in being on colluvial slopes rather than on uplands. Bridgeport soils are in higher areas than McCook soils, which are on the adjoining bottom lands.

Bridgeport silt loam, 0 to 1 percent slopes (Br).—This soil has the profile described as typical of the series. The areas are large and are easy to irrigate. Most of the acreage is cultivated. Erosion is not a hazard if an adequate

cover is maintained. (Capability unit IIc–1 dryland, and I–1 irrigated; Silty range site; Silty to Clayey windbreak group)

Bridgeport silt loam, 1 to 3 percent slopes (BrA).—This soil has smooth slopes. Some areas receive sediments from higher adjacent areas.

This soil is cultivated, and much of it is irrigated. In irrigated areas contour bench leveling for control of erosion is a common practice. (Capability unit IIe–1 dryland, and IIe–1 irrigated; Silty range site; Silty to Clayey windbreak group)

Bridgeport silt loam, 3 to 7 percent slopes (BrB).—This soil is at the base of moderate to strong upland slopes and on gentle breaks between terraces.

The surface layer is about as thick as that in the profile described for the series, but more stratification is evident.

This soil receives more runoff than other Bridgeport soils. It is subject to both siltation and scouring. Although some of it is cultivated, much of it has been left in native grass. If it is cultivated, diversions above it help to control erosion. (Capability unit IIIe–1 dryland, and IIIe–1 irrigated; Silty range site; Silty to Clayey windbreak group)

Broken alluvial land (0 to 15 percent slopes) (Sy).—This land type consists largely of mixed silty deposits. It occurs in narrow intermittent drainageways and creeks, along with areas of McCook loam, overflow. It is characterized by deep channels meandering across the nearly level canyon bottoms, making many small, irregular patches. The profile is highly stratified as a result of frequent overflow.

These areas are generally small and hard to reach with farm equipment. Most of them are in pasture; a few of the smoother patches are cropped, mainly to alfalfa. Small plants are washed out or covered by overflow following heavy spring rains. Annual weeds are hard to control. (Capability unit VIw–1 dryland; Silty Overflow range site; Moderately Wet windbreak group)

Colby Series

The Colby series consists of deep, medium-textured, well-drained and excessively drained, light-colored soils on uplands in all parts of the county. These soils are moderately sloping to strongly sloping. Most of the acreage is in mid and short native grasses.

Colby soils have rapid runoff, medium internal drainage, and moderate permeability. Their capacity to hold water is moderate. They are low in organic-matter content and in natural fertility, but the response to management is good. Tilled areas are highly susceptible to water erosion.

A typical profile has a 6-inch surface layer of grayish-brown silt loam. The surface layer is light brownish gray in some tilled areas where it is eroded and has been mixed with the underlying material. This layer is calcareous. The next layer is 4 inches thick and consists of light brownish-gray silt loam that has weak, coarse, prismatic structure and is highly calcareous. It is underlain by light-gray, massive, highly calcareous silt loam. In places this layer contains calcium carbonate concretions.

Typical profile, in a native grass pasture having a slope of about 17 percent, 0.25 mile east and 0.3 mile south of the northwest corner of sec. 33, T. 3 N., R. 31 W.:

A1—0 to 6 inches, grayish-brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) when moist; weak, coarse, subangular blocky structure breaking to weak, fine, granular structure; soft when dry, very friable when moist; calcareous and strongly effervescent; clear, smooth boundary.

AC—6 to 10 inches, light brownish-gray (10YR 6/2) silt loam, dark grayish brown (10YR 4/2) when moist; weak, coarse, prismatic structure; soft when dry, very friable when moist; highly calcareous and violently effervescent; gradual, wavy boundary.

C—10 to 60 inches, light-gray (10YR 7/2) silt loam, brown (10YR 5/3) when moist; massive; soft when dry, very friable when moist; highly calcareous and violently effervescent.

The surface layer ranges from 4 to 8 inches in thickness in areas of native grass, but it has been mixed with the underlying material in some cultivated areas. Calcium carbonate has been leached from this layer in only a few places.

Colby soils occur with Ulysses soils and with Rough broken land. They differ from Ulysses soils in lacking a B horizon.

Colby silt loam, 7 to 9 percent slopes (CbCW).—This soil is on breaks to the steep sides of canyons. The profile is like the one described for the series, except that the original surface layer has been removed by water erosion. The present surface layer is light brownish-gray, granular silt loam about 6 inches thick.

All of this soil has been cultivated, but in some places cultivation is not economically feasible, because of low natural fertility and the hazard of further erosion. (Capability unit IVe–8 dryland; Limy Upland range site; Silty to Clayey windbreak group)

Colby silt loam, 9 to 30 percent slopes (CbD).—This soil occurs on the sides of canyons. It has the profile described as typical of the series. The topography varies from smooth convex or plane slopes to abrupt vertical slopes. Because of the uneven topography, there are inclusions of other soils in the areas mapped. Any given mapped area is likely to be 5 to 20 percent Ulysses silt loam that has a slope range of 6 to 9 percent; 5 to 30 percent Rough broken land, loess; and 5 to 15 percent Bridgeport loam or silt loam that has a slope range of 1 to 3 percent.

The vegetation consists mostly of blue grama, side-oats grama, western wheatgrass, and little bluestem. Proper stocking and control of grazing help to maintain the desirable plants. (Capability unit VIe–9 dryland; Limy Upland range site; Silty to Clayey windbreak group)

Duroc Series

The Duroc series consists of deep, dark-colored, medium-textured soils that formed in calcareous alluvium on terraces along Blackwood Creek, Driftwood Creek, the Frenchman River, and the Republican River, toward the eastern part of the county. These soils are nearly level to very gently sloping and are well drained. They are protected from runoff and from wind erosion.

These soils are moderately permeable and very friable. They are excellent for irrigation. Corn is the principal crop, but all kinds of crops grown in the county are suitable.

A typical profile has a surface layer about 18 inches thick. There is an abrupt change from grayish-brown, granular silt loam in the upper part of this layer to dark grayish-brown, prismatic or subangular blocky silt loam in the lower part. The subsoil is grayish-brown, subangular blocky silt loam about 22 inches thick. Calcium carbonate is in the lower part of the subsoil at a depth of about 33 inches. The underlying material is light brownish-gray, massive silt loam.

Typical profile, in a cultivated field having a slope of less than 1 percent, 0.25 mile west and 100 feet south of the northwest corner of sec. 14, T. 3 N., R. 31 W.:

Ap—0 to 6 inches, grayish-brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) when moist; weak, fine, granular structure; soft when dry, very friable when moist; noncalcareous; abrupt, smooth boundary.

A1—6 to 18 inches, dark grayish-brown (10YR 4/2) silt loam, very dark brown (10YR 2/2) when moist; weak, coarse, prismatic structure breaking to weak, medium and fine, subangular blocky structure; soft when dry, very friable when moist; noncalcareous; clear, smooth boundary.

B2—18 to 33 inches, grayish-brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) when moist; weak, medium and fine, subangular blocky structure; slightly hard when dry, friable when moist; noncalcareous; clear, smooth boundary.

B3—33 to 40 inches, grayish-brown (10YR 5/2) silt loam, dark grayish brown (10YR 4/2) when moist; weak, medium and fine, subangular blocky structure; soft when dry, very friable when moist; calcareous and strongly effervescent; gradual, wavy boundary.

C—40 to 60 inches, light brownish-gray (10YR 6/2) silt loam, brown (10YR 5/3) when moist; massive; soft when dry, very friable when moist; calcareous and violently effervescent.

The A horizon is 8 to 22 inches thick. The subsoil is 12 to 24 inches thick, has a loam or heavy silt loam texture in places, and is grayish brown or dark grayish brown. Calcium carbonate is at a depth of 14 to 34 inches. The substratum ranges from light brownish gray to light gray in color.

Duroc soils differ from Bridgeport soils in having a darker colored surface layer and a weakly developed subsoil, and they are leached of calcium carbonate to a greater depth. They have a less well developed subsoil than Goshen soils. They are similar to Hord soils but are not so deeply leached.

Duroc silt loam, terrace, 0 to 1 percent slopes (2Dc).—This soil is on terraces along all the major streams. It has the profile described as typical of the series.

Runoff is slow, permeability is moderate, and drainage is good. Lack of moisture is the main limitation. This soil is well suited to irrigation, and the response to fertilizer is good. (Capability unit IIc–1 dryland, and I–1 irrigated; Silty range site; Silty to Clayey windbreak group)

Duroc silt loam, terrace, 1 to 3 percent slopes (2DcA).—This soil is on terraces along all the major streams.

Corn and milo are the chief crops. Water erosion is a hazard. Contour stripcropping, bench leveling, and crop-residue management are means of controlling erosion. Conserving moisture and fertilizing are important. (Capability unit IIe–1 dryland, and IIe–1 irrigated; Silty range site; Silty to Clayey windbreak group)

Dwyer Series

The Dwyer series consists of excessively drained soils that formed in windblown sand and silt derived mostly from limy sandstone and to some extent from alluvium. These soils are on low hummocks surrounding the sandier Valentine soils.

Dwyer soils have rapid internal drainage, rapid permeability, and slow runoff. They have low water-holding capacity and are somewhat droughty. Wind erosion is a severe hazard if these soils are tilled. Natural fertility is low.

These soils are better suited to native grasses than to other plants. Most of the acreage is under native vegetation of switchgrass, sand dropseed, little bluestem, prairie sandreed, and a scattering of western wheatgrass.

The surface layer typically is about 5 inches thick. It is grayish-brown loamy fine sand. Below this is a 13-inch transitional layer of light brownish-gray, subangular blocky to single-grain loamy fine sand to fine sand. The substratum is light-gray, single-grain fine sand. Calcium carbonate occurs at a depth of 18 inches.

Typical profile, in a native grass pasture having a slope of about 4 percent, 0.4 mile west and 0.15 mile south of the center of sec. 23, T. 2 N., R. 35 W.:

A1—0 to 5 inches, grayish-brown (10YR 5/2) loamy fine sand, very dark grayish brown (10YR 3/2) when moist; weak, fine, subangular blocky to granular structure; loose when dry, loose when moist; noncalcareous; clear, smooth boundary.

AC—5 to 18 inches, light brownish-gray (10YR 6/2) loamy fine sand to fine sand, dark grayish brown (10YR 4/2) when moist; weak, medium and fine, subangular blocky structure or single grain; loose when dry, loose when moist; noncalcareous; clear, smooth boundary.

C—18 to 42 inches +, light-gray (10YR 7/2) fine sand, brown (10YR 5/3) when moist; single grain; loose when dry, loose when moist; calcareous and slightly effervescent.

The surface layer ranges from 4 to 8 inches in thickness and is grayish brown to light brownish gray in color. The AC horizon ranges from brown to light brownish gray in color and from 13 to 22 inches in thickness. Calcium carbonate occurs at a depth of 18 to 36 inches. The substratum is commonly pale brown to light gray. Silty loess deposits are beneath the sand deposits in some places.

Dwyer soils occur with Valentine soils but have thicker, finer textured A and AC horizons and contain lime within 3 feet of the surface. They occur also with Anselmo soils but are coarser, are less coherent, and have a thinner solum.

Dwyer-Valentine loamy fine sands, 3 to 17 percent slopes (DVC).—These soils are in transitional areas between Anselmo soils and other Valentine soils, and they are in a lower position than the other Valentine soils.

The soils of this unit have profiles that are similar to those described for the Dwyer and Valentine series. Any given mapped area is about 70 percent Dwyer soil and 30 percent Valentine soil. The depth to calcium carbonate varies greatly.

These soils are in native grass pasture. Proper stocking and control of grazing help to control erosion and maintain production of forage. (Capability unit VIe–5 dryland; Sands range site; Very Sandy windbreak group)

Glenberg Series

The Glenberg series consists of nearly level, well-drained to somewhat poorly drained, moderately coarse textured soils that formed in recent alluvium. These soils are on bottom lands along the Republican River and the

Frenchman River. They are strongly alkaline in some areas.

These soils are friable and easily tilled. They absorb water readily and have a moderate to moderately low water-holding capacity. Some of the acreage is cultivated, and some is in native grass pasture.

The surface layer typically is about 7 inches thick. It is light brownish-gray fine sandy loam. Below this is a transitional layer of light brownish-gray fine sandy loam about 11 inches thick. The transitional layer has weak, coarse, prismatic structure breaking to subangular blocky. It is more calcareous than the surface layer. The underlying material is light-gray and light brownish-gray fine sandy loam to loamy sand. Clean, coarse river sediments are at a depth of 4 feet. The profile is calcareous.

Typical profile, in a cultivated field having a slope of less than 1 percent, 0.2 mile north and 0.1 mile east of the center of sec. 31, T. 3 N., R. 32 W.:

Ap—0 to 7 inches, light brownish-gray (10YR 6/2) fine sandy loam, dark grayish brown (10YR 4/2) when moist; weak, fine, granular structure; soft when dry, very friable when moist; slightly effervescent; abrupt, smooth boundary.

AC—7 to 18 inches, light brownish-gray (10YR 6.5/2) fine sandy loam, dark grayish brown to grayish brown (10YR 4.5/2) when moist; weak, coarse, prismatic structure breaking to weak, medium and coarse, subangular blocky structure; soft when dry, very friable when moist; calcareous and strongly effervescent; clear, smooth boundary.

C1 18 to 28 inches, light-gray (10YR 7/2) fine sandy loam, brown (10YR 5/3) when moist; weak, medium, subangular blocky structure breaking to weak, fine, crumb structure; soft when dry, very friable when moist; calcareous and strongly effervescent; gradual, wavy boundary.

C2—28 to 44 inches, light-gray (10YR 7/2) loamy very fine sand, grayish brown (10YR 5/2) when moist; weak, fine, crumb structure; soft when dry, very friable when moist; calcareous and strongly effervescent; clear, smooth boundary.

C3—44 to 48 inches, light brownish-gray (10YR 6.5/2) loamy sand, grayish brown (10YR 5/2) when moist; single grain; loose when dry, loose when moist; calcareous and strongly effervescent; abrupt, smooth boundary.

IIC4—48 to 54 inches, light-gray (10YR 7/2) clean sand, grayish brown (10YR 5/2) when moist; single grain; loose when dry, loose when moist; noncalcareous.

The surface layer ranges from 6 to 14 inches in thickness. The AC horizon is normally fine sandy loam but ranges to loam in the saline-alkali areas. The C horizon is coherent to a depth of about 36 inches. Below this, the alluvium is sandy. The water table is at a depth of about 10 feet except in the saline-alkali areas, where it is at about 4 feet. There are brownish-orange stains below a depth of 3 feet in places.

Glenberg soils have a coherent sandy substratum instead of a noncoherent one such as Bankard soils have. They have a coarser textured substratum than McCook soils.

Glenberg fine sandy loam (0 to 1 percent slopes) (Gd).—This soil is undulating or mounded. It has the profile described as typical of the series. Buried layers of loam or silt loam occur below a depth of 2 or 3 feet in some places.

This soil is well suited to irrigation, and most of it is cultivated. Corn, sorghum, alfalfa, and wheat are suitable crops. The control of wind erosion is a problem if the surface is left without cover. Stubble-mulch tillage is a good method of controlling erosion. (Capability unit IIe–3 dryland, and IIe–3 irrigated; Sandy Lowland range site; Sandy windbreak group)

Glenberg fine sandy loam, saline-alkali (0 to 1 percent slopes) (2Gd).—This soil occurs as scattered areas along the Frenchman River and the Republican River. It is somewhat poorly drained. The water table is normally at a depth of about 4 feet, but it fluctuates seasonally. The reaction is strongly alkaline; the pH value ranges from 8.5 in the surface layer to 9.6 in the substratum.

Some of this soil is cultivated, but many areas are being seeded to salt-tolerant grasses because of the alkalinity and the fluctuating water table. Irrigation, drainage, and fertilization greatly increase productivity. (Capability unit IVs 1 dryland, and IIIs–1 irrigated; Saline Lowland range site; Moderately Saline or Alkali windbreak group)

Goshen Series

The Goshen series consists of deep, dark-colored, medium-textured, well-drained, nearly level soils that formed in loess on uplands. These soils occupy plane or concave positions. They occur mainly in the northwestern and the eastern parts of the county.

These soils have slow runoff and moderate permeability. They are easily tilled and are high in natural fertility. The main limitation is lack of moisture.

A typical profile has a 16-inch surface layer of grayish-brown silt loam. The upper part of the subsoil is grayish-brown heavy silt loam, and the lower part is light brownish-gray silt loam. The subsoil has prismatic structure breaking to subangular blocky. The substratum is light-gray, prismatic or massive silt loam. It is calcareous and violently effervescent.

Typical profile, on a slope of less than 1 percent, 0.49 mile east and 300 feet north of the southwest corner of sec. 4, T. 3 N., R. 31 W.:

Ap—0 to 6 inches, grayish-brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) when moist; weak, fine, granular structure; soft when dry, very friable when moist; noncalcareous; abrupt, smooth boundary.

A1—6 to 16 inches, grayish-brown (10YR 5/2) silt loam, very dark brown to very dark grayish brown (10YR 2.5/2) when moist; weak, coarse, subangular blocky structure; soft when dry, very friable when moist; noncalcareous; abrupt, smooth boundary.

B2t—16 to 22 inches, grayish-brown (10YR 5/2) heavy silt loam, very dark grayish brown (10YR 3/2) when moist; weak, coarse, prismatic structure breaking to weak, fine and medium, subangular blocky structure; soft when dry, very friable when moist; noncalcareous; clear, smooth boundary.

B3—22 to 26 inches, light brownish-gray (10YR 6/2) silt loam, grayish brown to dark grayish brown (10YR 4.5/2) when moist; weak, coarse, prismatic structure breaking to weak, fine and medium, subangular blocky structure; soft when dry, very friable when moist; noncalcareous; clear, smooth boundary.

C—26 to 60 inches +, light-gray (10YR 7/2) silt loam, light brownish gray (10YR 6/2) when moist; weak, coarse, prismatic structure breaking to massive; soft when dry, very friable when moist; calcareous and violently effervescent.

The A horizon ranges from 12 to 18 inches in thickness. The profile contains a buried surface layer in some places. The texture of the subsoil ranges from heavy silt loam to silty clay loam.

Goshen soils are associated with Keith, Hord, and Duroc soils. They have a thicker surface layer than Keith soils and are more deeply leached of carbonates and of organic staining. They show more evidence of subsoil development than Hord and Duroc soils.

Although these soils are suited to all crops grown in the county, they are commonly used in a wheat and summer fallow cropping system.

Goshen silt loam, 0 to 1 percent slopes (Gh).—This soil occurs as plane or concave areas throughout the county. It has slow runoff and moderate permeability. Natural fertility is high.

All of the local crops can be grown. Wheat and sorghum are the chief crops. Under dryland farming, only small amounts of fertilizer are needed annually. (Capability unit IIc–1 dryland, and I–1 irrigated; Silty range site; Silty to Clayey windbreak group)

Haverson Series

The Haverson series consists of deep, well-drained, nearly level soils on bottom lands along the Republican River and the Frenchman River.

These soils have moderate permeability, moderate water-holding capacity, and medium natural fertility. They are very friable and are easily tilled. All crops grown in the county can be grown on these soils. Corn, sorghum, and alfalfa are the chief crops.

A typical profile has a 14-inch surface layer of light brownish-gray fine sandy loam to loam. The underlying alluvium is made up of stratified layers of sandy loam to silt loam. Within the substratum is a buried surface layer. Clean sand is at a depth below 5 feet. The profile is calcareous throughout.

A typical profile, in a cultivated field that has a slope of less than 1 percent, 0.08 mile west and 0.1 mile south of the east quarter corner of sec. 20, T. 2 N., R. 35 W.:

Ap—0 to 5 inches, light brownish-gray (10YR 6/2) fine sandy loam, dark grayish brown (10YR 4/2) when moist; weak, fine, granular structure; soft when dry, very friable when moist; calcareous and strongly effervescent; abrupt, smooth boundary.

A1—5 to 14 inches, light brownish-gray (10YR 6/2) loam, very dark grayish brown (10YR 3/2) when moist; weak, fine, granular structure; loose when dry, very friable when moist; calcareous and slightly effervescent; abrupt, smooth boundary.

C1 -14 to 22 inches, light brownish-gray (10YR 6/2) sandy loam, dark grayish brown (10YR 4/2) when moist; weak, fine, granular structure; loose when dry, very friable when moist; calcareous and slightly effervescent; abrupt, smooth boundary.

C2—22 to 40 inches, light-gray (10YR 7/2) silt loam, dark grayish brown (10YR 4/2) when moist; weak, fine, granular structure; soft when dry, very friable when moist; calcareous and strongly effervescent; clear, smooth boundary.

Ab1—40 to 48 inches, gray (10YR 6/1) silt loam, very dark grayish brown (10YR 3/2) when moist; weak, fine, granular structure; soft when dry, very friable when moist; calcareous and strongly effervescent; clear, smooth boundary.

C3—48 to 53 inches, light-gray (10YR 7/2) loam, brown (10YR 5/3) when moist; weak, coarse, subangular blocky structure breaking to weak, fine, granular structure; soft when dry, very friable when moist; calcareous and strongly effervescent; abrupt, smooth boundary.

Ab2—53 to 59 inches, gray (10YR 5/1) sandy loam, very dark brown (10YR 2/2) when moist; weak, fine, granular structure; loose when dry, very friable when moist; calcareous and strongly effervescent; clear, smooth boundary.

C4—59 to 66 inches, light brownish-gray (10YR 6/2) sandy loam, very dark grayish brown (10YR 3/2) when moist; weak, fine, granular structure; loose when dry, very friable when moist; calcareous and strongly effervescent; clear, smooth boundary.

IIC5—66 inches +, white (10YR 8/2) sand, brown (10YR 5/3) when moist; single grain; loose when dry, loose when moist; calcareous and strongly effervescent.

The thickness of the A horizon ranges from 5 to 14 inches. In some areas the texture is loam. The depth to the water table is generally about 12 feet, but in places it is only 6 feet.

Haverson soils are similar to McCook, Las, and Glenberg soils. They have a lighter colored surface layer than McCook soils. They are better drained than Las soils and less saline and alkaline than those soils. They are deeper to coarse sediments than Glenberg soils.

Haverson fine sandy loam (0 to 1 percent slopes) (Hf).—This soil is on bottom lands along the Republican River. It has the profile described as typical for the series. It is well suited to irrigation. Control of wind erosion is a problem unless adequate cover is maintained. Use of crop residue helps to hold the soil in place and to increase the organic-matter content. (Capability unit IIe–3 dryland, and IIe–3 irrigated; Sandy Lowland range site; Sandy windbreak group)

Haverson and Las loams, saline-alkali (0 to 1 percent slopes) (2Hl).—The soils of this undifferentiated unit are on bottom lands along the Republican River and the Frenchman River. Soils that have a moderately fine textured, columnar subsoil are included in the areas mapped.

Las loam has a light brownish-gray surface layer over a stratified substratum. It is similar to Haverson loam but is more saline and alkaline. Most areas of this unit are strongly alkaline, and crop growth is moderately affected.

Many areas are cultivated. Salt-tolerant crops are better suited than other kinds. Drainage is needed in a few areas. (Capability unit IVs–1 dryland, and IIIs–1 irrigated; Saline Lowland range site; Moderately Saline or Alkali windbreak group)

Hord Series

The Hord series consists of deep, dark-colored, medium-textured, nearly level soils that formed in loess and in colluvium washed from surrounding soils. These soils occur in upland swales. Although they are sometimes inundated for short periods, internal drainage is good and there is enough slope in most places to assure surface drainage.

These soils absorb water readily and have a moderate water-holding capacity. They are very friable and are easily tilled. Runoff from surrounding areas adds to the moisture supply. Most of the acreage is cultivated, and all the local crops can be grown.

The surface layer in a typical profile is about 30 inches thick and consists of gray silt loam or loam in the upper part, grading to dark-gray silt loam in the lower part. Underlying this is a transitional layer, about 12 inches thick, consisting of grayish-brown silt loam that has weak, medium and fine, subangular blocky structure. The transitional layer breaks clearly to a light brownish-gray

silt loam substratum. Calcium carbonate is at a depth of about 49 inches.

Typical profile, in a cultivated field having a slope of less than 1 percent, 200 feet south and 0.1 mile west of the northeast corner of sec. 33, T. 2 N., R. 34 W.:

Ap—0 to 8 inches, gray (10YR 5/1) silt loam, very dark brown (10YR 2/2) when moist; weak, medium and coarse, subangular blocky structure breaking to weak, fine, granular structure; soft when dry, very friable when moist; noncalcareous; abrupt, smooth boundary.

A11—8 to 16 inches, dark-gray (10YR 4/1) silt loam, black (10YR 2/1) when moist; weak, coarse, prismatic structure to massive; soft when dry, very friable when moist; noncalcareous; clear, smooth boundary.

A12—16 to 30 inches, dark-gray (10YR 4/1) silt loam, very dark brown (10YR 2/2) when moist; weak, coarse, prismatic structure breaking to weak, medium and fine, subangular blocky structure; soft when dry, very friable when moist; noncalcareous; clear, smooth boundary.

AC—30 to 42 inches, grayish-brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) when moist; weak, medium and fine, subangular blocky structure; soft when dry, very friable when moist; noncalcareous; clear, smooth boundary.

C1—42 to 49 inches, light brownish-gray (10YR 6/2) silt loam, dark grayish brown (10YR 4/2) when moist; weak, medium and fine, subangular blocky structure breaking to massive; soft when dry, very friable when moist; noncalcareous; abrupt, smooth boundary.

C2—49 to 60 inches, light brownish-gray (10YR 6/2) silt loam, dark grayish brown (10YR 4/2) when moist; massive; soft when dry, very friable when moist; calcareous and strongly effervescent.

The A horizon ranges from 18 to 36 inches in thickness and from gray to dark gray in color. The texture is silt loam or loam. Calcium carbonate is at a depth of 36 to 70 inches.

Hord soils occur with Keith, Goshen, and Scott soils. They are similar in texture to the Keith and Goshen soils but have a thicker surface layer and lack a B horizon. They are also more deeply leached of calcium carbonate, and they show some evidence of stratification. Hord soils have a thicker A horizon and are better drained than Scott soils, and they lack the clayey B horizon of the Scott soils.

Hord silt loam, 0 to 1 percent slopes (Hd).—This soil is in swales throughout the silty uplands.

All of the local crops can be grown, but corn and sorghum are better suited than other crops. Small grains are subject to lodging. (Capability unit IIc-1 dryland, and I-1 irrigated; Silty range site; Silty to Clayey windbreak group)

Keith Series

The Keith series consists of deep, medium-textured, well-drained soils that formed in loess. The native vegetation consisted of western wheatgrass, little bluestem, blue grama, buffalograss, and other mid and short grasses. These are the most extensive soils in the county. They are nearly level to gently sloping and occur on uplands.

These soils have moderate permeability, moderate water-holding capacity, and high natural fertility. Erosion by wind and water is the major hazard.

These soils are friable and easily tilled. Wheat, sorghum, and corn are the chief crops.

A typical profile has a 10-inch surface layer of grayish-brown silt loam. The upper part of the subsoil is grayish-brown heavy silt loam that has prismatic structure breaking to subangular blocky. The lower part is light brownish-gray silt loam. The substratum, at a depth of about 24 inches, is light-gray, massive silt loam. It is calcareous and violently effervescent.

Typical profile, in a cultivated field having a slope of about 1.5 percent, 0.2 mile east and 75 feet south of the northwest corner of sec. 35, T. 3 N., R. 33 W.:

Ap—0 to 6 inches, grayish-brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) when moist; weak, fine, granular structure; soft when dry, very friable when moist; noncalcareous, abrupt, smooth boundary.

A1—6 to 10 inches, grayish-brown (10YR 5/2) silt loam, very dark brown (10YR 2/2) when moist; weak, medium and fine, subangular blocky structure; soft when dry, very friable when moist; noncalcareous; clear, smooth boundary.

B2t—10 to 17 inches, grayish-brown (10YR 5/2) heavy silt loam, very dark grayish brown (10YR 3/2) when moist; weak, coarse, prismatic structure breaking to weak, medium and fine, subangular blocky structure; soft when dry, very friable when moist; noncalcareous; clear, smooth boundary.

B3—17 to 24 inches, light brownish-gray (10YR 6/2) silt loam, very dark grayish brown (10YR 4/2) when moist; weak, coarse, prismatic structure breaking to weak, medium and fine, subangular blocky structure; soft when dry, very friable when moist; noncalcareous; clear, smooth boundary.

C—24 to 48 inches, light-gray (10YR 7/2) silt loam, pale brown (10YR 6/3) when moist; massive; soft when dry, very friable when moist; calcareous and violently effervescent.

The A horizon ranges from 5 to 14 inches in thickness and is grayish-brown or dark grayish-brown in color. The subsoil ranges from 12 to 24 inches in thickness and is light brownish gray or light gray in the lower part. The depth to calcium carbonate is normally 16 to 30 inches in uneroded soils. The substratum ranges from light brownish gray to light gray.

Keith soils are similar to Goshen soils but have a thinner surface layer and do not have dark-colored organic staining below a depth of 20 inches. They have a thicker, more strongly developed subsoil than Ulysses soils and are leached of calcium carbonate to a greater depth.

Keith silt loam, 1 to 3 percent slopes (KeA).—This soil is on upland divides throughout the county. The slopes are plane to somewhat concave in shape. This soil has the profile described as typical of the series.

Corn, wheat, and sorghum are the chief crops grown. Wind and water erosion, which are the main hazards, can be controlled by making use of crop residue and by terracing. (Capability unit IIe-1 dryland, and IIe-1 irrigated; Silty range site; Silty to Clayey windbreak group)

Keith silt loam, 1 to 3 percent slopes, eroded (KeAW).—This soil occupies convex ridgetops throughout the uplands. It is subject to wind and water erosion. A few small areas of uneroded soils were included in mapping.

The surface layer is 6 inches thick or less. Water intake is slower and natural fertility lower than in uneroded Keith soils.

All of the local crops can be grown on this soil. Terracing, stubble mulching, summer fallowing, and other conservation practices help to control erosion. (Capability unit IIe-1 dryland, and IIe-1 irrigated; Silty range site; Silty to Clayey windbreak group)

Keith silt loam, 3 to 7 percent slopes (KeB).—This smoothly sloping soil is in native grass. Although it can be cultivated, most areas of it are too small and are better used with other soils as pasture. If it is cultivated, it will erode unless terraced and otherwise well managed. (Capability unit IIIe–1 dryland, and IIIe–1 irrigated; Silty range site; Silty to Clayey windbreak group)

Keith silt loam, 3 to 7 percent slopes, eroded (KeB2).—This moderately eroded soil has short, abrupt slopes. A few small areas of uneroded soil were included in mapping. The profile is similar to the one described as typical of the series, but the surface layer is thinner. Calcium carbonate is within 13 inches of the surface.

All of this soil is cultivated. Wheat, corn, and sorghum are the main crops. Terraces are needed to conserve moisture and control erosion. Wheat, sorghum, and other close-growing crops help to control erosion. (Capability unit IIIe–1 dryland, and IIIe–1 irrigated; Silty range site; Silty to Clayey windbreak group)

Keith and Goshen silt loams, 0 to 1 percent slopes (KG).—These soils have plane or slightly concave slopes. The profiles are like those described for the Keith and Goshen series.

All local crops can be grown on these soils. Wheat, corn, and sorghum are the chief crops. Summer fallow and stubble mulching are common methods of conserving moisture. (Capability unit IIc–1 dryland, and I–1 irrigated; Silty range site; Silty to Clayey windbreak group)

Las Series

The Las series consists of nearly level, strongly alkaline, somewhat poorly drained soils on bottom lands. These soils formed in loamy material over coarse river sediments. They are moderately deep to sand. The native vegetation consisted of big bluestem, switchgrass, indiangrass, and perennial forbs. The water table fluctuates between depths of 2 and 4 feet.

These soils are friable and easily worked, but they puddle if worked when wet. The salt concentrations and the high pH affect crop growth only moderately. Permeability is moderate, and the water-holding capacity is moderate. Drainage is somewhat poor because of slow runoff and the high water table. Many areas that have been cultivated are now being seeded to western wheatgrass or slender wheatgrass. Some areas are also being leveled for irrigation. Drainage is needed in irrigated areas where the water table is high.

A typical profile has a 10-inch surface layer of light brownish-gray loam. This grades to a substratum of loam and very fine sandy loam of weak, coarse, blocky structure. Coarse river sand is at a depth of about 33 inches.

A typical profile, in a cultivated field having a slope of less than 1 percent, 0.15 mile east and 0.12 mile south of the northwest corner of sec. 18, T. 3 N., R. 31 W.:

Ap—0 to 10 inches, light brownish-gray (10YR 6/2) loam, very dark grayish brown to dark grayish brown (10YR 3.5/2) when moist; weak, coarse, prismatic structure breaking to weak, fine, granular; soft when dry, very friable when moist; calcareous and strongly effervescent; pH 8.5; gradual, smooth boundary.

C1—10 to 18 inches, light brownish-gray (10YR 6/2) very fine sandy loam, dark grayish brown (10YR 4/2) when moist; weak, coarse, blocky structure; soft when dry, very friable when moist; calcareous and violently effervescent; pH 9.6; gradual, smooth boundary.

C2—18 to 33 inches, light brownish-gray (10YR 6/2) loam, dark grayish brown (10YR 4/2) when moist; weak, coarse, blocky structure; soft when dry, very friable when moist; calcareous and violently effervescent; pH 9.6; gradual, smooth boundary.

IIC3—33 to 42 inches, light-gray (10YR 7/2) coarse sand, grayish brown (10YR 5/2) when moist; single grain; loose when dry, loose when moist; calcareous and slightly effervescent; pH 9.1.

The surface layer ranges from 5 to 16 inches in thickness and from silt loam to fine sandy loam in texture. The color of this layer is generally light brownish gray but is grayish brown in places. The C1 and C2 horizons range from very fine sandy loam to silt loam in texture and from light brownish gray to light gray in color. A few faint mottles occur below a depth of 20 inches in places.

Coarse river sediments are at a depth of 30 to 36 inches. The pH value ranges from 8.0 to 9.6. In the surface layer, it is dominantly about 8.5, and in the substratum 9.5.

In this county, Las soils have been mapped in an undifferentiated unit with Haverson soils. They are also associated with Sandy alluvial land.

Las soils are similar to Haverson soils but are more alkaline and more poorly drained. They have a lighter colored surface layer than McCook soils and are more saline.

McCook Series

The McCook series consists of well-drained, medium-textured, nearly level soils that are underlain by coarse sandy sediments at a depth of 2½ to 12 feet. These soils are on bottom lands along all of the major streams. They are generally stratified. These are the most extensive bottom-land soils in the county.

These soils are very friable and are easily tilled. They have moderate permeability and moderate water-holding capacity. Although they range to strongly alkaline in the lower part, plant growth is not restricted. Erosion is normally not a hazard. Corn and sorghum are the chief crops, but all local crops can be grown. Much of the acreage is irrigated. Water is obtained from shallow wells or from irrigation canals.

A typical profile has a 14-inch surface layer of grayish-brown loam or silt loam. The underlying stratified alluvium ranges from light brownish-gray silt loam to light-gray very fine sandy loam. It has weak, medium and fine, subangular blocky structure. Buried layers are common. Calcium carbonate occurs throughout the profile.

A typical profile, in a cultivated field having a slope of less than 1 percent, 0.3 mile east and 0.2 mile south of the northwest corner of sec. 17., T. 2 N., R. 34 W.:

Ap—0 to 6 inches, grayish-brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) when moist; weak, fine, granular structure; soft when dry, very friable when moist; calcareous and slightly effervescent; abrupt, smooth boundary.

A1—6 to 14 inches, grayish-brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) when moist; weak, medium and fine, subangular blocky structure; soft when dry, very friable when moist; calcareous and strongly effervescent; gradual, wavy boundary.

C1—14 to 26 inches, light brownish-gray (10YR 6/2) silt loam, dark brown (10YR 4/3) when moist; weak, medium and fine, subangular blocky structure; soft when dry, very friable when moist; calcareous and strongly effervescent; gradual, wavy boundary.

C2—26 to 35 inches, light brownish-gray (10YR 6/2) loam, dark brown (10YR 4/3) when moist; weak, medium and fine, subangular blocky structure; soft when dry, very friable when moist; calcareous and strongly effervescent; clear, smooth boundary.

Ab—35 to 44 inches, dark grayish-brown (10YR 4/2) loam, very dark brown (10YR 2/2) when moist; weak, medium and fine, subangular blocky structure; soft when dry, very friable when moist; calcareous and strongly effervescent; clear, smooth boundary.

C3—44 to 60 inches +, light-gray (10YR 7/2) very fine sandy loam, grayish brown (10YR 5/2) when moist; weak, medium and fine, subangular blocky structure; soft when dry, very friable when moist; calcareous and violently effervescent.

The A horizon ranges from 8 to 22 inches in thickness. The depth to coarse sandy sediments ranges from 2½ to 12 feet. The depth to the water table ranges from 4 feet to more than 10 feet.

McCook soils are associated with Haverson, Glenberg, and Las soils. They have a darker colored surface layer than Haverson soils and a finer textured surface layer than Glenberg soils. They are better drained than Las soils and do not contain the salts or alkali that are characteristic of those soils.

McCook loam (0 to 1 percent slopes) (Mb).—This soil is along all the major drainageways. Because of its low position and the texture of the surface soil, wind erosion is not a serious hazard. Flood control on the major streams and conservation practices on the uplands have reduced the flood hazard. This soil has the profile described as typical of the series.

Corn and sorghum are the chief crops grown. The natural fertility is high. Many areas are irrigated. (Capability unit I–1 dryland, and I–1 irrigated; Silty Lowland range site; Silty to Clayey windbreak group)

McCook loam, overflow (0 to 1 percent slopes) (2Mb).—This soil is on bottom lands along the smaller streams and drainageways. It is flooded once or twice a year. As a result, it is more stratified than is typical of the series and has more buried layers. There are layers of coarser material throughout the profile.

Many areas are cultivated. Straightening channels and constructing dikes are ways of controlling overflow. (Capability unit IIw–3 dryland, and IIw–3 irrigated; Silty Overflow range site; Moderately Wet windbreak group)

McCook loam, sand substratum variant (0 to 1 percent slopes) (4Mb).—This soil is along the Frenchman River and along the Republican River in the eastern part of the county. It is close to the rivers, generally on the inside curve of a meandering channel and in a lower position than other McCook soils.

This soil is only moderately deep over sandy material. The thickness of the medium-textured layers ranges from 18 to 36 inches and averages 30 inches. The substratum ranges from fine sand to coarse sand and gravel. The water table is at a depth of 4 to 10 feet. Small sand spots on the surface and small areas of Glenberg soils were included in mapping.

This soil is commonly cultivated. It needs more fertilizer than the deeper soils of the series. (Capability unit IIs–5 dryland, and IIs–5 irrigated; Silty Lowland range site; Silty to Clayey windbreak group)

Platte Series

The Platte series consists of poorly drained, shallow soils over clean coarse sand and gravel. These soils adjoin the Republican River as stringers or old channels, along with Sandy alluvial land. The native vegetation consists of prairie cordgrass, switchgrass, indiangrass, and other coarse prairie grasses, along with scattered stands of willows.

These soils have moderate to slow permeability and slow runoff.

A typical profile has a surface layer of gray loam or silt loam about 7 inches thick. Underlying this is a 5-inch transitional layer of light brownish-gray, single-grain loamy sand. Clean sand is at a depth of 12 inches. The depth to the water table ranges from 0 to 4 feet, depending on the season of the year.

Typical profile, in native pasture on concave slope of less than 1 percent, 660 feet north and 220 feet east of S. quarter corner of sec. 17, T. 2 N., R. 34 W.:

A1—0 to 7 inches, gray (10YR 5/1) silt loam, very dark brown (10YR 2/2) when moist; massive; slightly hard when dry, friable when moist; calcareous and strongly effervescent; abrupt, smooth boundary.

AC 7 to 12 inches, light brownish-gray (10YR 6/2) loamy sand, dark grayish brown (10YR 4/2) when moist; single grain; loose when dry, loose when moist; calcareous and strongly effervescent; clear, smooth boundary.

IIC1—12 to 21 inches, light-gray (10YR 7/2) clean sand and gravel, light brownish gray (10YR 6/2) when moist; single grain; loose when dry, loose when moist; calcareous and strongly effervescent; gradual, wavy boundary.

IIC2—21 to 42 inches, gray to light-gray (10YR 6/1) wet sand and gravel, grayish brown (10YR 5/2) when moist; single grain; loose when dry, loose when wet; calcareous and strongly effervescent.

The surface layer is normally loam but is silt loam in places. It ranges from 1 inch to 8 inches in thickness. The layer below the surface ranges from silty clay to loamy sand in texture and from 3 to 10 inches in thickness. The depth to clean coarse sand and gravel is 4 to 18 inches.

Platte soils differ from Sandy alluvial land in having a loamy surface layer over the sand and gravel. They are shallower to the coarse substratum than Las soils.

Platte loam (0 to 1 percent slopes) (Pt).—The profile of this soil is like the one described for the series, except that the surface layer is loam instead of silt loam. This soil is too wet to be cultivated. It is normally used as pasture or meadowland along with larger areas of Sandy alluvial land. Coarse grasses grow well on this soil. (Capability unit Vw–1 dryland; Subirrigated range site; Wet windbreak group)

Rough broken land, caliche (30 to 45 percent slopes) (BCa).—This land type is characterized by nearly vertical exposures of limestone and sandstone of the Ogallala formation. The soil areas have a slope of about 30 percent. Sliding soil material has filled pockets, crevices, and lower spots. Most of the areas are long and narrow. Runoff is rapid, and drainage is excessive.

This land type provides some winter protection to livestock and wildlife, but it is so steep that it has only limited value for grazing. Except on the rock outcrops, there is a cover of grass. The blufflike slopes are a prominent, interesting feature in the landscape.

A representative site is in the southeastern part of the county, south of Driftwood Creek in the NE¼NE¼ sec. 13, T. 1 N., R. 32 W. (Capability unit VIIs–3 dryland; Shallow Limy range site; not in a windbreak group)

Rough broken land, loess (30 to 45 percent slopes) (Bl).—This land type occurs throughout the county in very steep canyons and on bluffs. It consists of silty, calcareous loess that shows little or no evidence of soil development. Soil slipping has created a succession of "catsteps," or short, vertical exposures of raw loess. Near the base of the canyons are vertical escarpments. The native vegetation in protected areas consists of western wheatgrass, and that on steep, exposed slopes consists of thin stands of side-oats grama, little bluestem, blue grama, buffalograss, and scattered yucca plants. Included in mapping were areas of Colby silt loam, Ulysses silt loam, Haverson loam, and Broken alluvial land. These inclusions have a slope range of 0 to 30 percent and make up about 40 percent of any given area.

Runoff is rapid, and drainage is excessive. Geologic erosion is active.

This land type provides some winter protection for cattle and wildlife. It is used for range, but cattle cannot graze the steeper areas. (Capability unit VIIe–1 dryland; Thin Loess range site; Silty to Clayey windbreak group)

Sandy alluvial land (0 to 2 percent slopes) (Sx).—This land type consists of water-deposited material ranging from fine sandy loam to gravel in texture. It is extensive along the Republican River and the Frenchman River. It is nearly level, except for mounds and channels created by floodwaters. The water table is at a depth of 2 to 8 feet. The vegetation consists of cottonwood trees, native grasses, and annual weeds.

A representative area is in the NW¼SW¼ sec. 13, T. 2 N., R. 35 W. Many areas have a thin, slightly darkened layer at the surface, but the areas of coarser sand and gravel show no evidence of soil development. Thin stratified layers of loamy material occur at various depths in some places.

This land type has a limited use for grazing and provides good habitat for wildlife. (Capability unit VIw–5 dryland; Sandy Lowland range site; Moderately Wet windbreak group)

Scott Series

The Scott series consists of deep, dark-colored, slowly permeable soils that have a claypan. These soils occur on uplands throughout the county but are most extensive in the northwestern corner. They occupy small, basinlike depressions that become lakes in wet years.

The vegetation is sparse, and many areas are barren. Pennsylvania smartweed is common in dry years, but in wet years it is confined mainly to the edges of the depressions. A few areas can be cultivated in dry years.

A typical profile has a 4-inch surface layer of dark-gray silt loam. Underlying this is a 2-inch layer of gray silt loam that has been oxidized and leached of organic matter and clay minerals. The upper 33 inches of the subsoil consists of dark-gray to gray silty clay that has moderate, prismatic and blocky structure. The substratum is light-gray, massive silt loam. The entire profile is noncalcareous.

A typical profile, in a cultivated field having a slope of less than 1 percent, 0.49 mile north and 0.2 mile east of the southwest corner of sec. 27, T. 4 N., R. 35 W.:

Ap—0 to 4 inches, dark-gray (10YR 4/1) silt loam, black (10YR 2/1) when moist; weak, fine, granular structure; soft when dry, very friable when moist; noncalcareous; abrupt, smooth boundary.

A2—4 to 6 inches, gray (10YR 5/1) silt loam, very dark gray (10YR 3/1) when moist; weak, thin, platy structure breaking to weak, fine, granular; soft when dry, very friable when moist; noncalcareous; abrupt, smooth boundary.

B21t 6 to 31 inches, dark-gray (7.5YR 4.5/0) silty clay, black (10YR 2/1) when moist; moderate, medium, prismatic structure breaking to moderate, medium and fine, angular blocky; hard when dry, firm when moist; noncalcareous; clear, smooth boundary.

B22t 31 to 39 inches, gray (10YR 5/1) silty clay, very dark gray (10YR 3/1) when moist; moderate, medium, prismatic structure breaking to moderate, medium and fine, angular blocky; slightly hard when dry, friable when moist; noncalcareous; clear, smooth boundary.

B3—39 to 48 inches, grayish-brown (10YR 5/2) silty clay loam, very dark grayish brown (10YR 3/2) when moist; weak, medium, subangular blocky structure; soft when dry, very friable when moist; noncalcareous; clear, smooth boundary.

C—48 to 56 inches +, light-gray (10YR 7/2) silt loam, brown (10YR 5/3) when moist; massive; soft when dry, very friable when moist; noncalcareous.

The A2 horizon is lacking in some areas. The B horizon ranges from 24 to 48 inches in thickness and from silty clay to silty clay loam in texture.

Scott soils have a finer textured subsoil and are more poorly drained than adjacent Hord and Goshen soils. They are also more deeply leached of calcium carbonate.

Scott silt loam (0 to 1 percent slopes) (Sc).—This soil is in upland depressions, or potholes, which are not extensive but are scattered throughout the nearly level uplands. Many of these potholes are too small to be mapped separately and are shown on the map by spot symbols.

During wet periods runoff from surrounding soils collects in the potholes. Because of the claypan subsoil, water drains out slowly, and the areas are sometimes inundated for long periods.

This soil is used for pasture along with surrounding soils or is left idle. A few areas are cultivated in dry years. (Capability unit VIw 2 dryland; Silty Overflow range site; Wet windbreak group)

Slickspots (0 to 1 percent slopes) (Ss).—This land type consists of somewhat poorly drained, strongly alkaline soil material that formed in silty to sandy alluvium. It occurs as areas 5 to 35 acres in size, scattered among Haverson and Las soils on the bottom lands along the Republican River. The alkalinity is the result of evaporation of saline ground water that has risen to the surface.

The surface layer is about 5 inches thick and consists of grayish-brown loam that has weak, granular structure. It contains a large amount of sodium, evidenced by a white surface crust when the soil is dry. This material is friable and easily worked. The texture of the subsurface layer ranges from loam in the upper part to fine sandy loam in the lower part, and the color from light

brownish gray to light gray. This layer has columnar structure. The substratum consists of stratified layers of fine sandy loam, loamy sand, and fine sand. Coarse river sediments are at a depth of about 4 feet.

Because of the sodium content, permeability and internal drainage are slow. Runoff is slow also. Moisture is released slowly, and consequently the areas are droughty. The water table generally is at a depth of 4 to 10 feet, but occasionally it is at the surface early in spring.

This land type is similar to Las soils but has a higher pH value and a stronger concentration of salts.

Most of the areas are in native grass; some are cultivated and irrigated with surrounding soils. Only salt-tolerant crops will grow. Alfalfa, tall wheatgrass, and corn are the principal crops. (Capability unit VIs–1 dryland, and IVs–1 irrigated; Saline Lowland range site; not in a windbreak group)

Ulysses Series

The Ulysses series consists of deep, well-drained, gently to moderately sloping soils that formed in loess. These soils are in all parts of the county. Western wheatgrass is the predominant native grass. Most of the smooth, gently sloping areas are cultivated. The moderately sloping areas are in native grass or have been cultivated and are now being seeded back to grass.

A typical profile has a 6-inch layer of grayish-brown silt loam. The subsoil is about 10 inches thick and consists of silt loam that has weak prismatic structure. It ranges from grayish-brown in the upper part to light brownish-gray in the lower part. The substratum is light brownish-gray and light-gray silt loam that is prismatic in structure but becomes massive with depth.

Permeability is moderate. Natural fertility is medium. Water erosion is a hazard in cultivated areas that are not protected.

Winter wheat and forage sorghum are the chief crops.

A typical profile, in a cultivated field having a slope of about 4 percent, 0.05 mile east and 200 feet south of the northwest corner of sec. 32, T. 2 N., R. 34 W.:

Ap—0 to 6 inches, grayish-brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) when moist; weak, fine, granular structure; soft when dry, very friable when moist; calcareous and strongly effervescent; clear, smooth boundary.

B21—6 to 10 inches, grayish-brown (10YR 5/2) silt loam, dark grayish brown (10YR 4/2) when moist; weak, coarse, prismatic structure breaking to weak, medium and fine, subangular blocky; soft when dry, very friable when moist; calcareous and violently effervescent; clear, smooth boundary.

B22—10 to 16 inches, light brownish-gray (10YR 6/2) silt loam, grayish brown to dark grayish brown (10YR 4.5/2) when moist; weak, coarse, prismatic structure breaking to weak, medium and fine, subangular blocky; soft when dry, very friable when moist; calcareous and violently effervescent; gradual, smooth boundary.

C1 -16 to 32 inches, light brownish-gray (10YR 6/2.5) silt loam, brown (10YR 5/3) when moist; weak, coarse, prismatic structure; soft when dry, very friable when moist; calcareous and violently effervescent; gradual, smooth boundary.

C2—32 to 44 inches, light-gray (10YR 7/2) silt loam, pale brown (10YR 6/3) when moist; massive; soft when dry, very friable when moist; calcareous and violently effervescent.

The surface layer ranges from 4 to 8 inches in thickness and is dark grayish brown in places. Calcium carbonate is at the surface in eroded areas and at a depth of 6 to 12 inches in uneroded areas.

Ulysses soils are associated with Keith and Colby soils. They have a thinner subsoil than Keith soils and have calcium carbonate closer to the surface. They have a weakly developed B horizon, which is lacking in Colby soils, and, under native grass, they are leached of calcium carbonate to a greater depth.

Ulysses silt loam, 3 to 7 percent slopes, eroded (UsB2).—This soil is on uplands bordering steep-sided canyons. It has the profile described as typical of the series.

This soil is cultivated or has been cultivated. Corn, sorghum, and wheat are the main crops. Fertilizer is needed. (Capability unit IIIe–1 dryland, and IIIe–1 irrigated; Limy Upland range site; Silty to Clayey windbreak group)

Ulysses silt loam, 7 to 9 percent slopes (UsC).—This soil occupies smooth, concave or plane slopes adjoining Colby soils, which are on steeper, convex slopes. There are inclusions of Colby soils in the areas mapped.

The surface layer is about 8 inches thick and is free of calcium carbonate. Otherwise the profile of this soil is like the one described for the series.

This soil is in its native vegetation, which consists of western wheatgrass, little bluestem, side-oats grama, and other mid and short grasses. (Capability unit IVe–1 dryland, and IVe–1 irrigated; Silty range site; Silty to Clayey windbreak group)

Ulysses and Colby silt loams, 7 to 9 percent slopes, eroded (UsC2).—These soils have plane or convex slopes and occur throughout the county. They are moderately to severely eroded. About 70 percent of any given area is Ulysses soil, and 30 percent is Colby soil.

The Ulysses soil is moderately eroded and has a surface layer 4 to 8 inches thick that is calcareous to the surface. The subsoil and substratum are like those in the typical profile.

The Colby soil is severely eroded. The original surface layer has been completely removed by erosion, and the present surface layer is light brownish-gray, granular silt loam.

These soils are cultivated, although they are better suited to grass. Wheat, corn, and sorghum are grown, but large amounts of barnyard manure and commercial fertilizer are required and conservation practices are needed to control erosion. (Capability unit IVe–1 dryland, and IVe–1 irrigated; Limy Upland range site; Silty to Clayey windbreak group)

Valentine Series

The Valentine series consists of deep, excessively drained soils on uplands. These soils formed in sand that was blown from the nearby riverbed. They are along the south side of the Republican River valley in the western part of the county and also on the southern edge of the Frenchman River valley southeast of Palisade. The wind has shaped them into small rounded hummocks and high dunelike hills. All areas are in native grass, predominantly switchgrass, sand dropseed, prairie sandreed, and needle-and-thread. Sand sagebrush is also common.

A typical profile has a 2-inch layer of grayish-brown, very porous fine sand. A transitional layer, about 3 inches thick, consists of brown fine sand only slightly different from the pale-brown fine sand substratum. Calcium carbonate is leached to a depth of more than 5 feet.

These soils are low in natural fertility. Internal drainage is rapid, and permeability is rapid. Precipitation is absorbed rapidly, and there is no runoff. Most of the water is readily released to plants. Wind erosion is a severe hazard in areas unprotected by vegetation.

These soils are suited only to native grass.

A typical profile, in native grass pasture having a slope of about 17 percent, 0.15 mile south and 0.1 mile east of the northwest corner of sec. 25, T. 2 N., R. 35 W.:

A—0 to 2 inches, grayish-brown (10YR 5/2) fine sand, very dark grayish brown (10YR 3/2) when moist; single grain; loose when dry, loose when moist; noncalcareous; clear, smooth boundary.

AC—2 to 5 inches, brown (10YR 5/3) fine sand, dark grayish brown (10YR 4/2) when moist; single grain; loose when dry, loose when moist; noncalcareous; gradual, wavy boundary.

C—5 to 60 inches +, pale-brown (10YR 6/3) fine sand, brown (10YR 5/3) when moist; single grain; loose when dry, loose when moist; noncalcareous.

The A horizon ranges from 2 to 8 inches in thickness. There is a very thin accumulation of fine sandy loam or loamy fine sand on the surface in places. The AC horizon ranges from 3 to 12 inches in thickness. The C horizon varies only in the coarseness of the sand.

Valentine soils have a sandier surface layer than Anselmo and Dwyer soils and are less coherent. They are also more deeply leached of calcium carbonate.

Valentine fine sand, rolling (VaC).—This soil occurs mostly as smooth hummocks but has a choppy relief in some areas. It is stabilized by native grasses. Wind erosion is a hazard in overgrazed areas. (Capability unit VIe-5 dryland; Sands range site; Very Sandy windbreak group)

Management of the Soils for Crops [1]

This section contains an explanation of the system of grouping soils into capability units according to their suitability for cultivated crops and pasture; discussions of the management of the soils in this county, by capability units; and a table showing predicted yields of the principal crops.

In Hitchcock County, lack of moisture is the most serious limiting factor in crop production. Because of the low annual rainfall, it is necessary to conserve moisture as much as possible. Stubble mulching is one way of conserving moisture. It increases water intake and reduces evaporation. Level terraces also help to retain moisture.

The Anselmo, Bayard, and other sandy soils are subject to wind erosion, especially if the surface is left bare during winter and spring. Residue management, stubble mulching, and stripcropping reduce the hazard of wind erosion.

Fertilizer is beneficial to crops in this county if the balance between soil moisture and the amount of fertilizer applied is right. Fertilizer should be applied according to the results of soil tests. Keith, Goshen, Duroc, and McCook soils are generally adequately supplied with phosphorus. None of the soils in the county are likely to be deficient in potassium. All should be tested before alfalfa is planted to determine the need for phosphorus. The eroded Keith and Ulysses soils and the Colby, Anselmo, and other sandy soils may be deficient in iron, zinc, and other minor elements.

Capability Classification

Capability classification is the grouping of soils to show, in a general way, their suitability for farming. It is a practical classification based on limitations of the soils, the risk of damage when they are used, and the way they respond to treatment when used for the major field crops and forage plants. The classification does not apply to horticultural crops, rice, or other crops that have special requirements. The soils are classified according to degree and kind of permanent limitation, but without consideration of major and generally expensive alterations in slope, depth, or other characteristics of the soils, and without consideration of possible but unlikely major reclamation projects. For a more complete explanation of the capability classification, see USDA Handbook No. 210, "Land Capability Classification" (*6*)[2]

In the capability system, all kinds of soils are grouped at three levels: the capability class, the subclass, and the unit.

CAPABILITY CLASSES, the broadest groupings, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use, defined as follows:

Class I. Soils that have few limitations that restrict their use.

Class II. Soils that have some limitations that reduce the choice of plants or require moderate conservation practices.

Class III. Soils that have severe limitations that reduce the choice of plants, or require special conservation practices, or both.

Class IV. Soils that have severe limitations that restrict the choice of plants, or require very careful management, or both.

Class V. Soils that are subject to little or no erosion but have other limitations, impractical to remove, that limit their use largely to pasture, range, woodland, or wildlife.

Class VI. Soils that have severe limitations that make them generally unsuitable for cultivation and limit their use largely to pasture, woodland, or wildlife.

Class VII. Soils that have very severe limitations that make them unsuitable for cultivation and that restrict their use largely to grazing, woodland, or wildlife.

Class VIII. Soils and landforms that have limitations that preclude their use for commercial plant production and restrict their use to recreation, wildlife, or water supply, or to esthetic

[1] By E. O. PETERSON, conservation agronomist, Soil Conservation Service.

[2] Italic numbers in parentheses refer to Literature Cited, p. 48.

purposes. (There are no class VIII soils in Hitchcock County.)

CAPABILITY SUBCLASSES are soil groups within classes; they are designated by adding a small letter, *e*, *w*, *s*, or *c*, to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is too cold or too dry.

In class I there are no subclasses, because the soils of this class have few limitations. Class V can contain, at the most, only subclasses indicated by *w*, *s*, and *c*, because the soils in it are subject to little or no erosion, though they have other limitations that restrict their use largely to pasture, range, woodland, wildlife, or recreation.

CAPABILITY UNITS are soil groups within the subclasses. The soils in one capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity and other responses to management. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, IIw-3 or IIIe-1. Thus, in one symbol, the Roman numeral designates the capability class, or degree of limitation; the small letter indicates the subclass, or kind of limitation, as defined in the foregoing paragraphs; and the Arabic numeral identifies the capability unit within each subclass.

Capability units are generally identified by numbers assigned locally and are part of a statewide system. Not all the units in the system are represented in Hitchcock County; consequently, the capability units described in this survey are not numbered consecutively.

Both dryland farming and irrigated farming are practiced in Hitchcock County, and each capability unit is designated as either irrigated or dryland. Soils that are farmed partly under irrigation and partly as dryland are in two capability units. Anselmo fine sandy loam, 1 to 3 percent slopes, for example, is in capability unit IIIe-3 dryland and IIe-3 irrigated. The "Guide to Mapping Units" shows which group each individual soil is in.

Dryland Capability Units

Small grain, corn, sorghum, and alfalfa are common dryland crops in Hitchcock County. Because of the low rainfall and the consequent need to conserve moisture, cropping systems commonly include a year of fallow.

Capability unit I-1 dryland

This unit consists of deep, nearly level, medium-textured soils on bottom lands and benches. These soils absorb water readily, hold a large amount of it, and release it readily to plants. They are easily worked. Maintaining fertility and controlling wind erosion are the main management needs. Wind erosion is a hazard only if the surface is unprotected.

Corn, wheat, sorghum, and alfalfa are commonly grown. Small grains are less well suited than corn because they tend to grow rank and fall down before harvest time.

These soils can be farmed intensively without risk of damage if fertility is maintained. Fertility can be maintained by rotating crops, applying fertilizer, and including a legume or a grass-legume mixture in the cropping system. Rotating crops also aids in maintaining tilth and in controlling diseases and insects.

Capability unit IIe-1 dryland

This unit consists of deep, medium-textured, very gently sloping soils. These soils are easily worked. They absorb moisture readily but lose some through runoff. Crops are affected by shortage of moisture almost every year. Conserving moisture and controlling wind and water erosion are the main management problems.

These soils are well suited to wheat, other small grains, and grain sorghum. Wheat is the main crop grown.

Stubble mulching and using a cropping system in which wheat is alternated with fallow are ways of controlling wind erosion, conserving moisture, and maintaining fertility. Also suitable is a 3-year cropping system of fallow, wheat, and either another small grain or grain sorghum. Terracing (fig. 7), stripcropping on the contour, and returning residue help to control erosion.

Capability unit IIe-3 dryland

This unit consists of deep, nearly level, moderately coarse textured soils that are easily worked. These soils absorb water readily and release it readily to plants, but crops are likely to be affected by shortage of moisture nearly every year. Controlling erosion, especially wind erosion, is the main problem. Maintaining fertility and conserving moisture are also important.

These soils are well suited to wheat and other small grains and to grain sorghum. Corn can be grown in some years. A rotation of wheat and fallow is suitable if stubble-mulch tillage is used. A large amount of residue should be left on the surface during the fallow year. If a 3-year cropping system is used, a suitable sequence is 1 year of wheat, 1 year of fallow, and 1 year of another small grain, grain sorghum, or corn. Wind erosion can be controlled by stubble mulching and wind stripcropping. All plant residue should be returned to the soil.

Capability unit IIw-3 dryland

McCook loam, overflow, is the only soil in this capability unit. This is a deep soil on the bottom lands of the smaller streams and drainageways. It is flooded once or twice a year. In dry years the additional water benefits crops if it does not come too fast.

Corn, sorghum, wheat, and tame grasses are suitable for crops. Alfalfa can be grown, but it is damaged by excess water.

Fertility can be maintained by including a legume in the cropping system at least once every 6 years and limiting row crops to 3 consecutive years. Nitrogen is beneficial to all crops except legumes. In some fields diversion channels can be used to remove excess water and reduce the risk of flooding.

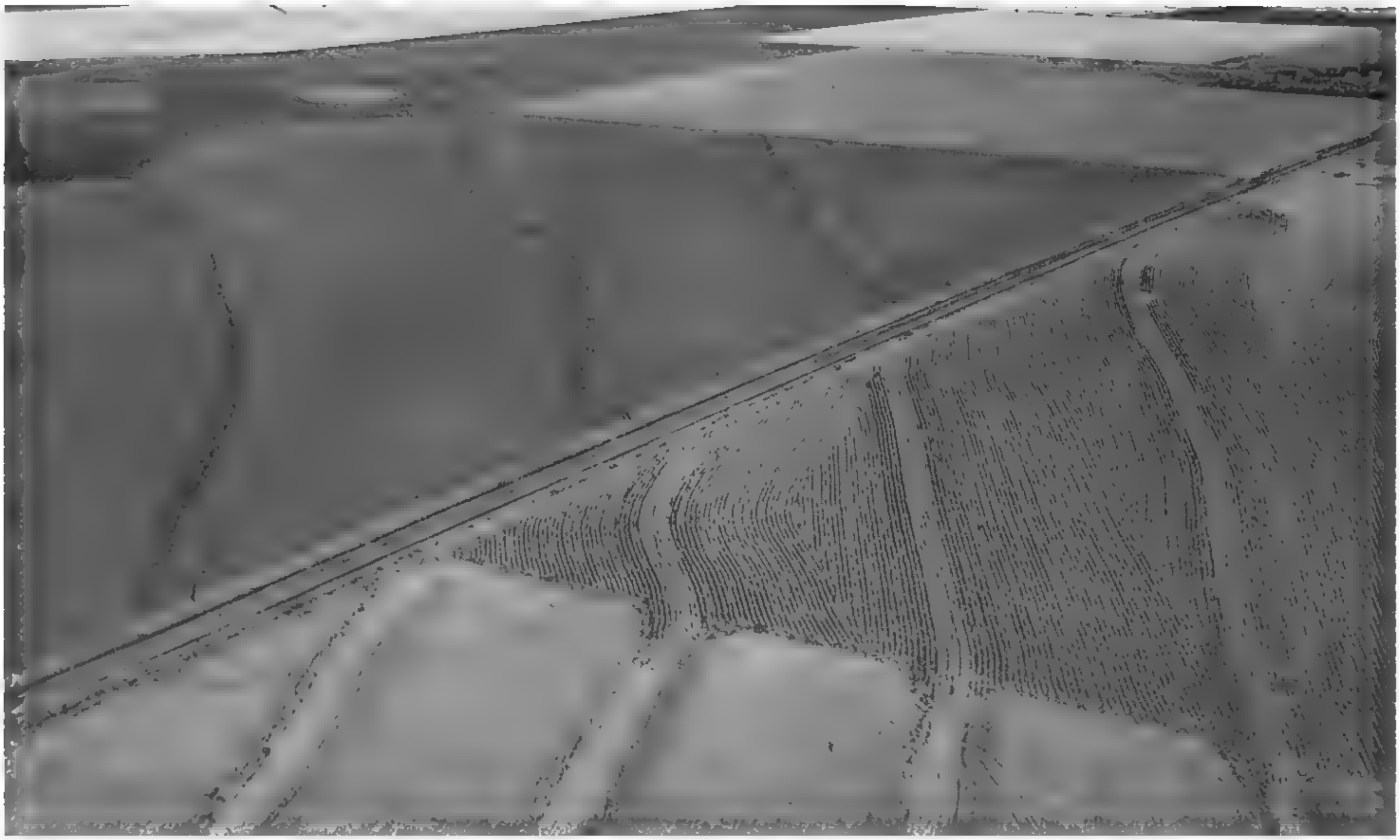

Figure 7.—**New flat channel terraces on far side of road; conventional terraces on near side. The soil is Keith silt loam, 1 to 3 percent slopes, which is in capability unit IIe–1 dryland.**

Capability unit IIs–5 dryland

McCook loam, sand substratum variant, is the only soil in this capability unit. This nearly level soil is on bottom lands and terraces. It has a loamy subsoil and is underlain by coarse sand and gravel at a depth of 18 to 36 inches. This soil absorbs water readily and releases it readily to crops, but, because of the coarse substratum, it does not store large amounts of water. Maintaining fertility and tilth and conserving moisture are the main needs. The hazard of erosion is slight.

Corn, sorghum, wheat, and tame grass are suitable crops. Alfalfa can be grown, but stands are short lived because of droughtiness.

Stubble mulching is a means of reducing evaporation, improving tilth, and controlling erosion. Including legumes and grass in the cropping system improves tilth and helps to maintain fertility.

Capability unit IIc–1 dryland

This unit consists of deep, medium-textured, nearly level soils. These soils are easily worked, and they absorb water readily. Scarcity of moisture damages crops almost every year. Conserving moisture is the main management problem. Wind erosion is a hazard, especially in dry years.

These soils are well suited to wheat, other small grains, and grain sorghum. A cropping system in which wheat is alternated with fallow conserves moisture and maintains fertility. In a 3-year cropping system, a suitable sequence would be 1 year of fallow, wheat, and either another small grain or grain sorghum.

Stripcropping and stubble mulching are ways of conserving moisture, adding organic matter, and controlling wind erosion. Constructing level terraces also aids in conserving moisture. This practice may be necessary to protect adjoining lower soils from runoff and erosion.

Capability unit IIIe–1 dryland

This unit consists of deep, gently sloping, medium-textured soils on uplands and foot slopes. These soils are slightly or moderately eroded. They are easy to work. They absorb water well, but the more sloping areas lose some rainfall through runoff. Crops are damaged almost every year by shortage of moisture. Conserving moisture and controlling wind and water erosion are the main management problems.

Small grain and sorghum are suitable crops, and wheat can be grown under proper management. Alternating wheat with fallow is a good system if fallowed fields are stubble mulched. In a 3-year cropping system, a suitable sequence is 1 year each of fallow, wheat, and either another small grain or grain sorghum.

Slopes of more than 1 percent ought to be terraced and stripcropped (fig. 8). All plant residues ought to be returned to the soil. Commercial fertilizer is needed, especially on the moderately eroded soils.

Figure 8.—**Terracing and contour stripcropping on Keith silt loam, 3 to 7 percent slopes, in capability unit IIIe-1 dryland.**

Capability unit IIIe-3 dryland

This unit consists of moderately coarse textured, very gently sloping or gently sloping soils on uplands. These soils absorb water readily and release it readily to plants. Nevertheless, crops are damaged nearly every year by scarcity of moisture. Controlling wind and water erosion is the main problem. Maintaining fertility and conserving moisture are also important.

These soils are suited to wheat and other small grains and to grain sorghum. They are only fairly well suited to corn and are more susceptible to erosion when planted to corn.

Terracing, cover cropping, contour stripcropping, and stubble mulching are needed to control wind and water erosion and conserve moisture.

Capability unit IIIe-5 dryland

This unit consists of nearly level to very gently sloping, sandy soils. These soils are on bottom lands, stream terraces, and uplands and in areas characterized by low hummocks. They absorb water well and release it readily to plants. Permeability is rapid, and the water-holding capacity is low. Erosion is generally slight, but there are a few moderately eroded areas. Conserving moisture, maintaining fertility, and controlling wind erosion are the main management requirements.

These soils are suited mainly to corn, wheat, sorghum, alfalfa, and tame grasses. A suitable cropping system consists of a row crop followed by a legume or small grain.

Stripcropping, stubble mulching, and field shelterbelts are effective in controlling wind erosion. Growing legumes in the cropping system provides cover throughout the year and thus helps to protect the soil from erosion, improves fertility, and increases the content of organic matter. Nitrogen fertilizer is needed for all crops except legumes.

Capability unit IVe-1 dryland

This unit consists of moderately sloping, medium-textured soils that are severely susceptible to erosion. These soils absorb water readily but lose a large amount of rainfall through runoff. Crops are likely to be damaged every year by lack of moisture. Conserving moisture and controlling wind and water erosion are the main problems.

These soils are not well suited to row crops. They are suited to grass and fairly well suited to small grain. A suitable cropping system consists of wheat alternated

Figure 9.—**Stripcropping and field windbreak, to left of road, for control of wind erosion on Anselmo fine sandy loam, 5 to 9 percent slopes. This soil is in capability unit IVe-3 dryland.**

with fallow, or 1 year each of fallow, wheat, and grain sorghum. Another small grain can be substituted for wheat or grain sorghum. An occasional stand of grass should be included in the cropping system.

Terracing, contour stripcropping, and stubble mulching are means of controlling erosion, improving tilth, and maintaining fertility. Returning crop residue to the soil also improves tilth.

Capability unit IVe-3 dryland

Anselmo fine sandy loam, 5 to 9 percent slopes, is the only soil in this capability unit. It is a deep, rolling soil on uplands. This soil absorbs and releases water readily, but the more sloping areas lose a large amount of water through runoff. Crops are damaged every year by lack of moisture. Conserving moisture and controlling wind and water erosion are the main management problems. Maintaining fertility is also important.

Small grain and sorghum are fairly well suited to this soil, but grass is a better crop for controlling wind and water erosion. Alternating wheat with fallow is a suitable cropping system.

Contour stripcropping, terracing, and cover cropping are needed (fig. 9). It is important to return all crop residue to the soil. Stubble mulching is needed, especially when a field is fallowed.

Capability unit IVe-5 dryland

Anselmo loamy fine sand, 3 to 7 percent slopes, is the only soil in this capability unit. This deep soil absorbs most of the water that falls, but it holds little water for plants. Controlling wind erosion is the main problem, but controlling water erosion, conserving moisture, and maintaining fertility are also important.

Grass and other close-growing crops that keep the soil from blowing are better suited than row crops. Wheat, barley, rye, and grain sorghum are suitable, although yields are generally low.

Wind erosion can be controlled by keeping the soil covered with crops, grass, or residue. If fields are stubble mulched during the fallow period, a suitable cropping system is 1 year each of fallow, wheat or rye, and grain sorghum, followed by grass. Wind stripcropping and contour stripcropping help to control wind and water erosion.

Capability unit IVe-8 dryland

Colby silt loam, 7 to 9 percent slopes, is the only soil in this capability unit. This soil is on uplands. It absorbs water fairly well but loses a large amount through runoff. This soil is subject to severe erosion. Crops are likely to be damaged each year by shortage of moisture. The

chief management problems are conserving moisture and controlling water and wind erosion.

This soil is fairly well suited to wheat and other small grains and to grain sorghum. It is better suited to grass.

Among the management needs are terracing, contour stripcropping, and stubble mulching. A suitable cropping sequence is wheat alternated with fallow. The fields should be stubble mulched during the fallow period, and grass should be grown occasionally instead of wheat.

Capability unit IVs-1 dryland

This unit consists of deep, moderately saline and alkali soils on bottom lands. The depth to the water table ranges from 4 to more than 6 feet, and salts accumulate where the water rises to the surface and evaporates. Some of these salts break down soil structure and create alkaline areas.

Corn, wheat, alfalfa, and tame grasses are suitable crops. Wheat, alfalfa, and some of the grasses are more alkali tolerant than corn and consequently more suitable for the more strongly alkaline areas.

Drainage to lower the water table is practical in some areas. Some saline-alkali areas can be improved by chemical treatment.

Capability unit Vw-1 dryland

Platte loam is the only soil in this capability unit. This soil is on bottom lands and has a water table near the surface. It is used for native hay and pasture. Drainage to make it suitable for cultivation is not practical.

Capability unit VIe-5 dryland

This unit consists of deep, rolling soils that are too sandy, droughty, and erodible for cultivation. They are better suited to grass for grazing. Areas now cultivated should be seeded to native grasses.

Capability unit VIe-9 dryland

Colby silt loam, 9 to 30 percent slopes, is the only soil in this capability unit. This is a deep soil on uplands. It has been cut by many side drains and has rough topography (fig. 10). The surface layer is thin. Runoff is rapid, and in unprotected areas the erosion hazard is severe.

This soil is not suitable for cultivation but can be used for grazing.

Capability unit VIw-1 dryland

Broken alluvial land is the only mapping unit in this capability unit. This land type is subject to frequent flooding. The areas are hard to reach and are too narrow

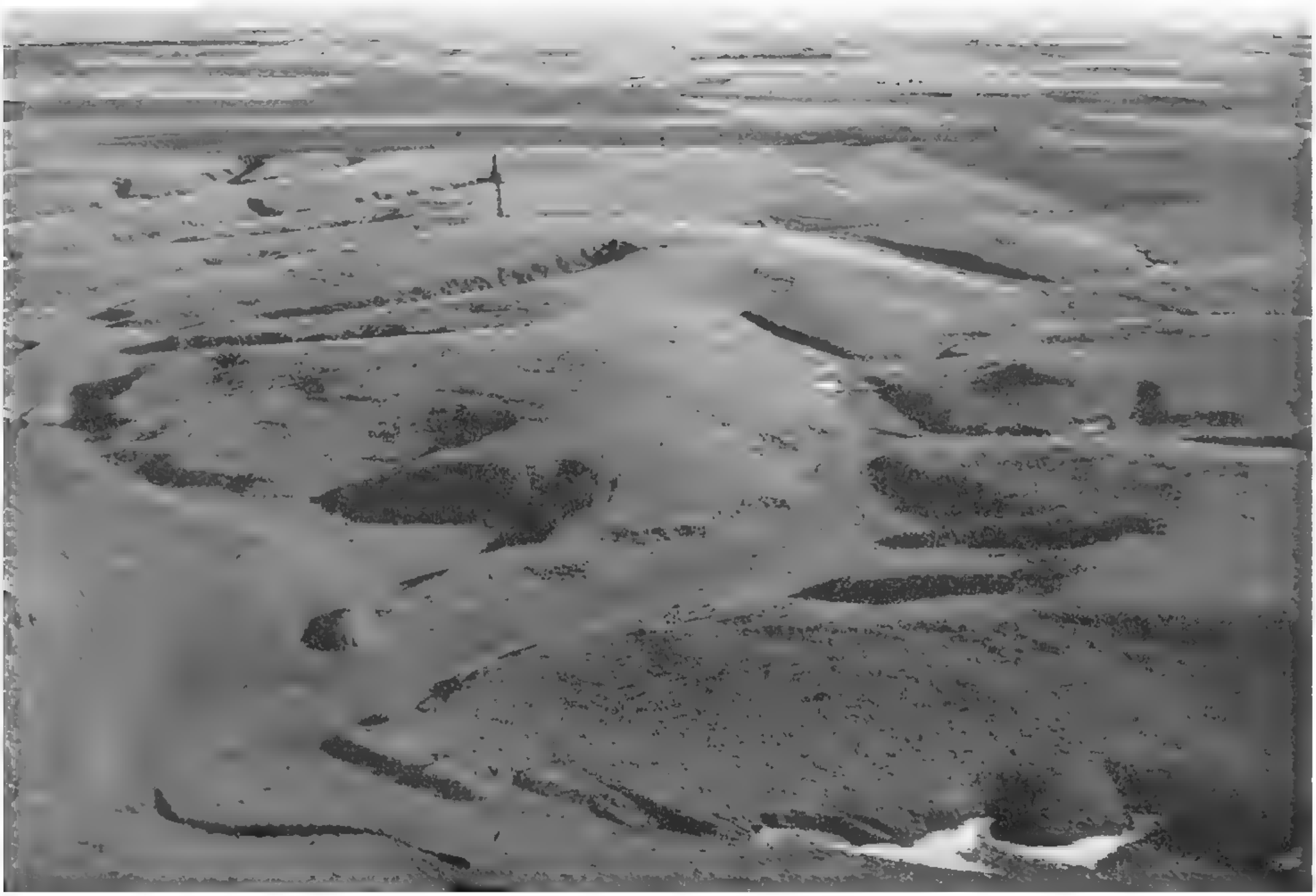

***Figure 10.*—Typical landscape of Colby silt loam, 9 to 30 percent slopes, which is in capability unit VIe-9 dryland.**

and too frequently flooded to be cultivated. Cover crops, grass, or trees can be established. Under good management, a fair stand of grass can be obtained. The areas are ideal habitat for deer, squirrel, pheasant, and quail.

Capability unit VIw–2 dryland

Scott silt loam is the only soil in this capability unit. This is a nearly level soil that occurs in small potholes in which water collects. It has a thick, dark-colored, moderately fine textured claypan and, consequently, is somewhat poorly drained to poorly drained. The vegetation is sparse, mostly weeds, and many of the potholes are barren. In wet years the potholes are intermittent lakes.

These potholes are not suitable for cultivation, because crops are drowned out. They are good habitat for small upland game.

Capability unit VIw–5 dryland

Sandy alluvial land is the only mapping unit in this capability unit. It has a moderately high water table. It is too sandy and, at times, too wet for cultivation. It is well suited to grass and other pasture plants and can be used for hay and for grazing.

Capability unit VIs–1 dryland

Slickspots is the only mapping unit in this capability unit. It is somewhat poorly drained and strongly alkaline and is generally unsuitable for cultivation. Though some areas can be used for crops if management is good, this land is better suited to alkali-tolerant grasses for grazing or hay.

Capability unit VIIe–1 dryland

Rough broken land, loess, is the only mapping unit in this capability unit. This land type is in canyons and on bluffs. It has limited use for grass or trees, but most of it is too steep for cultivation. Maintaining a good cover of grass is the only means of controlling runoff and erosion and conserving moisture. Many sites are suitable for stock-water dams, grade-control structures, and flood-detention reservoirs.

Capability unit VIIs–3 dryland

Rough broken land, caliche, is the only mapping unit in this capability unit. It has limited use for grass, but most of it is too rocky and too steep to be cultivated. Control of grazing and other practices are needed to maintain a good cover of grass. Keeping a good stand of grass in the cracks and crevices of the rocks is the only effective means of controlling runoff and conserving moisture. Stock-water dams, grade-control structures, and flood-detention reservoirs can be built if the sites are carefully selected.

Irrigated Capability Units

The area of irrigated land in Hitchcock County is approximately 25,000 acres. Most of it is in the valleys of the Frenchman River and the Republican River. Corn, sorghum, and alfalfa are the main irrigated crops. Irrigation is mostly by the furrow, border, or sprinkler method.

Land leveling for irrigation exposes subsoil that is low in available iron, zinc, phosphorus, and nitrogen. Barnyard manure or commercial fertilizer is needed to make up for these deficiencies.

Capability unit I–1 irrigated

This unit consists of deep, nearly level, medium-textured soils on bottom lands and benches. These soils are easily worked and are well suited to irrigation. They absorb water well, release it readily to plants, and have a moderate water-holding capacity. Maintaining fertility and using irrigation water properly are the main management needs. Wind erosion is a hazard if the surface is left bare during winter and spring.

Fertility can be maintained by rotating crops and by applying fertilizer. Rotating crops also aids in the control of insects and plant diseases. Fertility and tilth can be improved by including a legume or a legume-grass mixture in the cropping system. Wind erosion can be controlled by leaving crop residue on the surface or, if that is not possible, by keeping the surface rough.

Capability unit IIe–1 irrigated

This unit consists of very gently sloping, deep, medium-textured soils on benches and uplands. These soils absorb water readily, hold a large amount, and release it readily to plants. Controlling irrigation water, controlling erosion, and maintaining fertility are the main management needs.

Corn, sorghum, and alfalfa are the chief crops.

Returning crop residue to the soil and applying fertilizer are ways of maintaining fertility. Including a legume or a grass-legume mixture in the cropping system also helps to maintain fertility as well as tilth. Rotating crops is a means of controlling diseases and insects. Wind erosion can be controlled by leaving crop residue on the surface during winter and spring or by roughening the soil. The erosion hazard can be reduced by regulating the volume of irrigation water, changing the direction, and using the correct length of run. Land leveling to reduce the hazard of erosion and allow more uniform distribution of water should be considered.

Capability unit IIe–3 irrigated

This unit consists of moderately coarse textured, level to very gently sloping soils on benches, uplands, and well-drained lowlands. These moderately sandy soils are easily tilled. Most of them have moderately rapid permeability. Because of the fine sandy loam surface layer, they warm up rapidly in spring. Wind erosion is the main hazard.

Corn, sorghum, and alfalfa are the main crops grown.

Including a legume or a legume-grass mixture in the cropping system improves tilth and fertility. Rotating crops is a means of controlling diseases and insects. Maintaining a cover crop, especially during winter and spring, helps to control erosion. Land leveling permits even distribution of irrigation water and reduces the hazard of erosion. Adjusting the length of run and the size of the stream is necessary for efficient irrigation. Frequent applications of fertilizer are needed.

Capability unit IIw–3 irrigated

McCook loam, overflow, is the only soil in this capability unit. This is a deep, nearly level soil on bottom

lands that are flooded an average of twice a year. The floods often occur in spring before planting and are beneficial because they add moisture. Floods that occur during the growing season damage crops.

Corn, alfalfa, grain sorghum, and forage sorghum are suitable crops.

Control of flooding and maintenance of tilth and fertility are the main management problems. Surplus water can be removed and flooding controlled by land leveling and the use of diversions and dikes. Rotating crops helps to control insects and diseases. Including a legume or a legume-grass mixture in the cropping system improves tilth and fertility.

Capability unit IIs-5 irrigated

McCook loam, sand substratum variant, is the only soil in this capability unit. It is a well-drained soil on bottom lands. It has a loamy subsoil and is underlain by clean sand at a depth of about 30 inches. The water-holding capacity is only moderate. Consequently, frequent light irrigations are needed. If the surface is not protected, there is a risk of wind erosion.

A cropping system that improves tilth and fertility is needed. It should include a cover crop to control wind erosion.

Capability unit IIIe-1 irrigated

This unit consists of deep, gently sloping, medium-textured soils on uplands and foot slopes. Some of these soils are moderately eroded.

Wheat, corn, alfalfa, sorghum, and grass are suitable crops. Three years of row crops and 2 years of legumes or a grass-legume mixture is a suitable cropping system.

Because of the risk of erosion, these soils are only fairly well suited to irrigation. Contour bench leveling, contour furrowing, and other practices are needed. If sprinkler irrigation is used, terracing and contour farming are needed to control water erosion. Where the surface layer has been disturbed by leveling, a large amount of fertilizer is needed. Barnyard manure, trace elements, nitrogen, and phosphorus are especially beneficial.

Capability unit IIIe-3 irrigated

Anselmo fine sandy loam, 3 to 5 percent slopes, is the only soil in this capability unit. It is a deep, well-drained soil on foot slopes and other upland positions. This soil readily absorbs water and releases it to plants, but it cannot hold as much water as silty soils. The chief problems are controlling wind and water erosion, maintaining fertility, and using irrigation water properly.

Corn and sorghum are suitable crops, and alfalfa can be grown.

Including a legume or a legume-grass mixture in the cropping system, making use of crop residue, and strip-cropping in a narrow field pattern are ways of controlling erosion. Frequent irrigations are needed because of the fine sandy loam texture and the low water-holding capacity. Land leveling and contour bench leveling permit better control of irrigation water and runoff.

Capability unit IIIe-5 irrigated

This unit consists of deep, excessively drained, sandy soils on uplands and bottom lands. These soils are level to gently sloping. They are subject to severe wind erosion. They absorb water readily, have low organic-matter content, and low water-holding capacity. Runoff is slow. Controlling wind erosion is the main problem. Maintaining fertility and controlling irrigation water also are problems.

Corn, sorghum, and alfalfa are commonly grown. Because of the wind erosion hazard, hay and small grain and other crops that leave a large amount of residue are suitable. Removal of a crop for silage is not a good practice. Minimum tillage and maximum use of crop residue help to control wind erosion. Either barnyard manure or commercial fertilizer is needed.

Sprinkler irrigation works well on these soils because of the high intake rate. Any gravity system should have short runs, large streams, and frequent irrigations. Areas that have been leveled can be irrigated by the border, furrow, or corrugation method.

Capability unit IIIs-1 irrigated

This unit consists of somewhat poorly drained, strongly alkaline soils on bottom lands of the Republican River and the Frenchman River.

Alkalinity is the main limitation. The concentrations of alkali and salts result from the rise and fall of the water table and the evaporation of moisture from the soil surface.

These soils, without treatment, are suited to tall wheatgrass and other alkali-tolerant grass crops. Corn, alfalfa, and other irrigated crops can be grown if the alkali content is reduced.

Drainage to lower the water table, the use of chemicals to neutralize the alkali, and irrigation to leach the soil are means of reducing alkalinity. Land leveling is needed for efficient irrigation and uniform leaching, and frequent irrigation is needed. Crops respond to fertilizer.

Capability unit IVe-1 irrigated

This unit consists of deep, well-drained, medium-textured soils on uplands. These soils are moderately sloping.

Controlling erosion and managing irrigation water are the main problems. The erosion hazard can be reduced by growing grass, grass-legume mixtures, small grains, or other close-growing crops. Row crops are not suitable.

Sprinkling is the best method of irrigating hay and pasture crops. Contour ditch irrigation can be used for small grains and grass-legume mixtures, but it is less efficient than the sprinkler method. Terraces are needed to control water erosion, and grassed waterways can be used to carry away excess water. Fertilizer is needed, especially phosphorus, if a legume is grown.

Capability unit IVe-3 irrigated

Anselmo fine sandy loam, 5 to 9 percent slopes, is the only soil in this capability unit. It is a deep soil on uplands. The main management problems are maintenance of fertility, control of wind and water erosion, and efficient irrigation.

This soil is suited to corn, alfalfa, sorghum, and grasses. Crops that provide year-round cover are best for erosion control. It is advisable not to remove crops for silage.

Because of the slope, sprinkling is the best method of irrigation.

Capability unit IVe-5 irrigated

Anselmo loamy fine sand, 3 to 7 percent slopes, is the only soil in this capability unit. It is a deep soil on uplands. Maintaining fertility and managing irrigation water are the main problems.

Alfalfa, an alfalfa-grass mixture, wheat, rye, corn, and sorghum are suitable crops, especially alfalfa or an alfalfa-grass mixture.

This soil is only poor to fair for irrigation because of the wind erosion hazard and the uneven topography. The time of irrigation, the right amount of water, and even distribution are extremely important. Sprinkling is the best method. Cover crops are needed for control of erosion. Row crops should be harvested for grain only, in order to leave crop residue on the surface. Crops respond to nitrogen, phosphorus, and zinc.

Capability unit IVs-1 irrigated

Slickspots is the only mapping unit in this capability unit. This land type is strongly saline-alkali. Areas of it are scattered throughout bottom lands of the Republican River. Many areas are cultivated, but crops are severely affected by salts unless the soil is treated. The water table is at a depth of 4 to 10 feet.

Tall wheatgrass, slender wheatgrass, reed canary-grass, and other alkali-tolerant grasses are suitable.

These areas can be reclaimed by drainage to lower the water table, by land leveling to permit uniform leaching, and by irrigation to leach out the soluble salts. Chemical amendments can be used to neutralize some of the alkali. Areas that have been reclaimed can be used and managed the same as soils in capability unit IIw-3 irrigated.

Predicted Yields

The average acre yields of the principal crops under two levels of management are given in table 2. In columns A are the yields under prevailing management. In columns B are yields that can be expected under improved management, which would include use of cropping systems, use of crop residue, and application of fertilizer according to results indicated by soil tests.

The predicted yields in table 2 are based on data from the annual Nebraska Agricultural Statistics Report, on the experience of farmers in the county, on information from the county agricultural agent, and on data compiled by the staff of the local Soil Conservation Service. They represent 10-year averages. Weather conditions, new crops and varieties, and other factors could make a difference.

TABLE 2.—*Predicted average acre yields of principal crops*

[In columns A are yields under prevailing management; in columns B are yields under improved management. Absence of figure indicates the crop is not suited to the soil or is not commonly grown]

Mapping unit	Corn				Wheat		Sorghum				Alfalfa			
	Dryland		Irrigated				Grain		Forage		Dryland		Irrigated	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B
	Bu.	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*
Anselmo fine sandy loam, 0 to 1 percent slopes	23	29	68	81	16	21	20	29	1.9	2.2	1.5	1.7	3.0	4.5
Anselmo fine sandy loam, 1 to 3 percent slopes	21	28	65	81	15	20	19	28	1.8	2.2	1.4	1.6	3.5	4.5
Anselmo fine sandy loam, 3 to 5 percent slopes	18	23	62	73	13	18	17	25	1.6	1.8	1.3	1.4	3.0	3.5
Anselmo fine sandy loam, 5 to 9 percent slopes	14	17	56	69	11	13	14	18	1.1	1.3	.8	1.0	2.5	3.2
Anselmo loamy fine sand, 0 to 3 percent slopes	18	25	62	81	14	20	17	28	1.6	2.2	1.3	1.6	3.0	3.7
Anselmo loamy fine sand, 3 to 7 percent slopes	15	21	56	71	11	18	15	25	1.4	1.8	1.0	1.2	2.0	2.7
Bankard loamy fine sand	12	16	35	55	7	12	11	17	.9	1.3	1.0	1.2	2.2	3.0
Bayard fine sandy loam, 0 to 1 percent slopes	21	29	70	90	18	24	20	26	1.5	2.0	2.0	3.0	3.5	4.5
Bayard fine sandy loam, 1 to 3 percent slopes	19	26	65	85	17	23	18	25	1.2	1.7	1.5	2.5	3.0	4.0
Bayard loam, 0 to 1 percent slopes	25	35	75	95	21	26	27	35	2.5	3.0	3.0	3.5	4.7	5.0
Bayard loamy fine sand, hummocky	14	20	48	70	11	18	10	18	.9	1.5	1.3	1.7	2.5	3.5
Bridgeport silt loam, 0 to 1 percent slopes	20	28	75	100	23	29	26	32	1.5	2.0	2.5	3.0	4.5	5.0
Bridgeport silt loam, 1 to 3 percent slopes	18	27	75	95	22	28	24	30	1.2	1.7	2.0	2.5	4.5	5.0
Bridgeport silt loam, 3 to 7 percent slopes	12	16	55	90	18	25	20	27	1.0	1.5	1.0	1.5	4.0	4.5
Broken alluvial land	---	---	---	---	---	---	---	---	---	---	.8	1.0	---	---
Colby silt loam, 7 to 9 percent slopes	4	6	---	---	8	12	6	10	.5	1.0	.2	.5	---	---
Colby silt loam, 9 to 30 percent slopes	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Duroc silt loam, terrace, 0 to 1 percent slopes	23	31	75	100	24	30	29	37	1.2	1.7	2.5	3.0	4.5	5.0
Duroc silt loam, terrace, 1 to 3 percent slopes	21	29	75	95	23	29	27	34	1.0	1.5	2.0	2.7	4.0	4.5
Dwyer-Valentine loamy fine sands, 3 to 17 percent slopes	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Glenberg fine sandy loam	18	23	60	80	18	23	22	33	2.0	2.5	2.0	2.5	4.7	5.0
Glenberg fine sandy loam, saline-alkali	11	15	33	48	8	12		---	.5	.6	1.5	2.0	1.7	2.7
Goshen silt loam, 0 to 1 percent slopes	21	25	80	95	24	30	28	32	2.0	2.5	1.0	1.5	4.7	5.0
Haverson fine sandy loam	20	25	70	95	20	28	25	35	2.7	3.2	2.5	3.0	4.7	5.0
Haverson and Las loams, saline-alkali	10	14	30	45	7	12	---	---	.4	.5	1.5	2.0	2.0	3.0
Hord silt loam, 0 to 1 percent slopes	22	28	80	95	24	31	28	32	2.4	2.8	1.5	2.0	4.7	5.0
Keith silt loam, 1 to 3 percent slopes	18	24	75	95	19	25	24	29	1.2	1.7	1.0	1.7	4.5	5.0
Keith silt loam, 1 to 3 percent slopes, eroded	17	24	70	85	17	23	24	29	1.0	1.5	1.0	1.5	4.2	4.5
Keith silt loam, 3 to 7 percent slopes	12	15	60	80	16	21	22	27	1.0	1.2	.7	1.0	3.5	4.0

TABLE 2.—*Predicted average acre yields of principal crops*—Continued

Mapping unit	Corn				Wheat		Sorghum				Alfalfa			
	Dryland		Irrigated				Grain		Forage		Dryland		Irrigated	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B
	Bu.	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*
Keith silt loam, 3 to 7 percent slopes, eroded	12	15	55	80	15	21	20	27	1.0	1.2	.5	1.0	3.2	3.7
Keith and Goshen silt loams, 0 to 1 percent slopes	20	26	75	95	22	29	27	31	1.2	1.7	1.0	2.0	4.7	5.0
McCook loam	25	35	75	95	23	29	30	38	3.0	3.2	3.0	3.5	4.7	5.0
McCook loam, overflow	20	35	70	95	20	29	30	38	2.9	3.2	3.0	3.5	4.5	5.0
McCook loam, sand substratum variant	20	30	65	85	20	25	25	35	2.5	2.7	2.5	3.0	4.7	5.0
Platte loam	---	---	---			---	---	---	---	---	---	---	---	---
Rough broken land, caliche	---	---	---	---	---	---	---	---	---		---	---	---	---
Rough broken land, loess	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Sandy alluvial land	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Scott silt loam	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Slickspots	---	---	---	---	---	---	---	---	---	---	.6	1.0	1.0	1.7
Ulysses silt loam, 3 to 7 percent slopes, eroded	13	16	55	80	15	24	20	27	1.0	1.2	.5	1.0	3.0	3.5
Ulysses silt loam, 7 to 9 percent slopes	9	12		---	11	16	17	20	.8	1.0	.2	.7	---	---
Ulysses and Colby silt loams, 7 to 9 percent slopes, eroded	8	10	---	---	10	15	16	20	.7	1.0	.2	1.0	---	---
Valentine fine sand, rolling	---	---				---	---	---	---	---	---	---	---	---

Management of the Soils for Range[3]

About 200,000 acres, or nearly half of the farmland of the county, is range. Range is scattered throughout the county but is somewhat concentrated along the Republican River. Most of it is not suitable for cultivation. The average acreage of range per farm is about 350 acres. Raising livestock, mainly cows and calves, and selling calves as feeders, is the largest agricultural enterprise in the county.

Range Sites and Condition Classes

A range site is a distinctive kind of range that produces a kind and amount of climax vegetation significantly different from that on other sites. A significant difference is one that is great enough to necessitate different management to maintain or improve the vegetation. Climax vegetation is the combination of plants that originally grew on a given site. The most productive combination of range plants on a site is generally the climax type of vegetation.

Vegetation is altered by intensive grazing. Livestock graze selectively. They constantly seek the more palatable and nutritious plants. Climax plants react to grazing by decreasing or increasing. The decreasers are the plants most heavily grazed and, consequently, the first to be injured by overgrazing. The increasers either withstand grazing better or are less palatable to the livestock; they increase under grazing and replace the decreasers. If heavy grazing continues, they, too, eventually decrease and are replaced by invaders.

Range condition is classified according to the percentage of climax vegetation on the site. There are four range condition classes. The condition is *excellent* if 76 to 100 percent of the vegetation is climax; *good* if 51 to 75 percent is climax; *fair* if 26 to 50 percent is climax; and *poor* if 0 to 25 percent is climax.

[3] PETER N. JENSEN, range conservationist, Soil Conservation Service, Lincoln, Nebr., prepared this section.

Descriptions of the Range Sites

In this section brief descriptions of the range sites are given, including topography, location, soil texture, and climax vegetation. The annual yield per acre of forage is also given. The "Guide to Mapping Units" shows which site each individual soil is in.

Subirrigated range site

Platte loam, which is a nearly level soil on bottom lands, is the only mapping unit in this range site. It varies in texture and depth and is calcareous in places. The moderately high water table, which is at a depth of 10 to 60 inches, has been the dominant influence on the vegetation. It is within the root zone during the growing season.

At least 75 percent of the climax plant cover is a mixture of big bluestem, indiangrass, switchgrass, little bluestem, prairie cordgrass, Canada wildrye, and other decreasers. Western wheatgrass and sedges are the main increasers. Kentucky bluegrass, foxtail barley, blue verbena, and annuals are the main invaders.

If rainfall is average and the site is in excellent condition, the annual yield of forage is 5,000 to 6,000 pounds, air-dry weight.

Silty Overflow range site

This site is on bottom lands that are flooded periodically. The texture of the surface layer ranges from very fine sandy loam to silty clay loam. Flooding and silt deposition, moderate water-holding capacity, and a moderate infiltration rate have been the dominant influences on the vegetation.

Decreasers make up at least 65 percent of the climax cover. Big bluestem, indiangrass, switchgrass, little blue-

stem, and Canada wildrye are the main decreasers. Western wheatgrass, side-oats grama, and sedges are the main increasers. Kentucky bluegrass, western ragweed, Baldwin ironweed, and annuals are the main invaders.

If rainfall is average and the site is in excellent condition, the annual yield of forage is 4,000 to 5,000 pounds, air-dry weight.

Sandy Lowland range site

This site consists of nearly level soils on bottom lands and terraces. The texture of the surface layer ranges from sandy loam to loamy sand, and that of the underlying layer from sandy loam to fine sand. The bottom lands are flooded periodically, and the water table is at a depth of 5 to 8 feet. Flooding and the water table have been the dominant influences on the vegetation.

Decreasers make up about 70 percent of the climax plant cover. Sand bluestem, indiangrass, switchgrass, little bluestem, needle-and-thread, and Canada wildrye are the main decreasers. Prairie sandreed, blue grama, sand dropseed, western wheatgrass, and sedges are increasers. Western ragweed and annuals are common invaders.

If rainfall is average and the site is in excellent condition, the annual yield of forage is 3,000 to 4,000 pounds, air-dry weight.

Silty Lowland range site

This site consists of soils on seldom flooded bottom lands and terraces. The texture of the surface layer and underlying layer ranges from very fine sandy loam to silty clay loam. The high water-holding capacity, the moderate infiltration rate, and the runoff from higher lying soils have been the dominant influences on the vegetation.

Decreasers make up at least 70 percent of the climax plant cover. Big bluestem, indiangrass, little bluestem, switchgrass, needle-and-thread, and Canada wildrye are the main decreasers. Blue grama, sand dropseed, side-oats grama, and western wheatgrass are increasers. Western ragweed, Baldwin ironweed, and Kentucky bluegrass are invaders.

If rainfall is average and the site is in excellent condition, the annual yield of forage is 3,000 to 4,500 pounds, air-dry weight.

Saline Lowland range site

This site consists of nearly level soils on bottom lands. The texture of the surface layer ranges from silt loam to fine sandy loam and that of the underlying layer from fine sandy loam to silty clay. These soils are strongly saline-alkali. They have a water table at a depth of 5 to 8 feet. The salts and alkali and the water table have been the dominant influences on the vegetation.

Decreasers make up 70 percent of the climax plants. Alkali sacaton, indiangrass, switchgrass, western wheatgrass, and Canada wildrye are the main ones. Inland saltgrass and sedges are increasers. Foxtail barley, Kentucky bluegrass, and bromes are invaders.

If rainfall is average and the site is in excellent condition, the annual yield of forage is 3,000 to 4,500 pounds, air-dry weight.

Sands range site

This site consists of very gently sloping to moderately steep soils on ridges, hummocks, and old meander bars. The texture of the surface layer and underlying layer ranges from loamy sand to sand. The depth to available moisture has been the dominant influence on vegetation.

Decreasers make up about 60 percent of the climax plant cover. Indiangrass, sand bluestem, sand lovegrass, switchgrass, prairie junegrass, and Canada wildrye are the main decreasers. Blue grama, little bluestem, needle-and-thread, prairie sandreed, sand dropseed, and sedges are increasers. Western ragweed, gray sagewort, and annuals are invaders.

If rainfall is average and the site is in excellent condition, the annual yield of forage is 2,000 to 3,000 pounds, air-dry weight.

Sandy range site

This site consists of nearly level to moderately sloping soils on uplands. These soils are moderately deep to deep and are well drained to somewhat excessively drained. The infiltration rate is moderately rapid. The texture of the surface layer ranges from very fine sandy loam to loamy fine sand, and that of the underlying layer from fine sandy loam to fine sand. The infiltration rate and the drainage have been the dominant influences on the vegetation.

Decreasers make up at least 65 percent of the climax plant cover. Indiangrass, little bluestem, sand bluestem, switchgrass, and needle-and-thread are the main decreasers. Prairie sandreed, blue grama, sand dropseed, sand paspalum, and western wheatgrass are increasers. Western ragweed, windmillgrass, tumblegrass, and annuals are invaders.

If rainfall is average and the site is in excellent condition, the annual yield of forage is 2,000 to 3,000 pounds, air-dry weight.

Silty range site

This site consists of level to gently sloping, moderately deep and deep soils on uplands. These soils have moderate to moderately slow infiltration, good drainage, and a high water-holding capacity. The texture of the surface layer is loam or silt loam. The rate of infiltration, the drainage, and the water-holding capacity have been the dominant influences on the vegetation.

Decreasers make up about 55 percent of the climax plant cover. Big bluestem, little bluestem, indiangrass, and switchgrass are the main decreasers. Blue grama, buffalograss, side-oats grama, and western wheatgrass are increasers. Western ragweed, plains pricklypear, blue verbena, and annuals are invaders.

If rainfall is average and the site is in excellent condition, the annual yield of forage is 2,500 to 3,500 pounds, air-dry weight.

Limy Upland range site

This site consists of nearly level to steep soils on uplands and foot slopes. These soils are well drained and are slightly to strongly calcareous. The texture of the surface layer is silt loam. The good balance between the

water supply and the limy soil condition has been the dominant influence on the vegetation.

Decreasers make up at least 60 percent of the climax plant cover. Big bluestem, little bluestem, switchgrass, and indiangrass are the main decreasers. Blue grama, buffalograss, and side-oats grama are increasers. Western ragweed, plains pricklypear, blue verbena, and annuals are common invaders.

If rainfall is average and the site is in excellent condition, the annual yield of forage is 1,500 to 3,000 pounds, air-dry weight.

Shallow Limy range site

Rough broken land, caliche, the only mapping unit in this range site, is on uplands. The slope range is from nearly level to steep. The texture is loam to silt loam. The water-holding capacity is low. The depth to limestone or caliche is 20 inches or less. The water-holding capacity and the content of lime have been the dominant influences on the vegetation.

Decreasers make up at least 70 percent of the climax plant cover. Little bluestem, big bluestem, side-oats grama, switchgrass, and plains muhly are the main decreasers. Blue grama, hairy grama, and sand dropseed are increasers. Broom snakeweed, plains pricklypear, and annuals are common invaders.

If rainfall is average and the site is in excellent condition, the annual yield of forage is 2,000 to 3,000 pounds, air-dry weight.

Thin Loess range site

Rough broken land, loess, the only mapping unit in this range site, is on uplands marked by many catsteps and slips. The slope is steep to very steep. Some areas are colluvium. Some are deep, well-drained silt loam that is moderately to strongly calcareous to or nearly to the surface. Steepness of slope, excessive runoff, lack of profile development, and a high content of lime have been the dominant influences on the vegetation.

Decreasers make up about 65 percent of the climax plant cover. Little bluestem, big bluestem, side-oats grama, switchgrass, and plains muhly are the main decreasers. Blue grama, sand dropseed, and threadleaf sedge are increasers. Broom snakeweed and annuals are common invaders.

If rainfall is average and the site is in excellent condition, the annual yield of forage is 1,500 to 2,500 pounds, air-dry weight.

Management of the Soils for Woodland and Windbreaks

Native woodland in Hitchcock County is limited mainly to the bottom lands along the larger streams. Along the Republican River there are stands of cottonwood in which American elm and willow are scattered as understory. Along the Frenchman River are stands of cottonwood with a little American elm and green ash. In the valleys of Blackwood and Driftwood Creeks, green ash is predominant, and there is some hackberry, cottonwood, and American elm. Bur Oak Canyon, in the southeastern part of the county, has a stand of bur oak, and this is about as far west as bur oak grows. Native shrubs growing in the canyons include buffaloberry, coralberry, three-leaved sumac, smooth sumac, American plum, and chokecherry. Shrubby willow grows on sandbars and along the banks of most streams.

These stands of native trees and shrubs have little value as sources of wood products. They provide a few posts and poles and some firewood for local use. They are more important for such purposes as wildlife habitat, livestock shelter, and watershed protection.

Windbreaks for protection of fields and farmsteads are the most important use of trees in Hitchcock County. Windbreaks control wind erosion, control snow drifting, shelter livestock and wildlife, protect buildings, and provide many indirect benefits.

Trees are not easily established in Hitchcock County. Hot, dry winds and lack of rainfall are the chief hazards. Studies of windbreaks more than 15 years old show that the best trees for most sites are conifers, chiefly eastern redcedar, ponderosa pine, Austrian pine, and Rocky Mountain juniper. Several broadleaf trees and shrubs are suitable for windbreaks. Among them are honeylocust, hackberry, mulberry, American plum, chokecherry, and lilac.

The rate of tree growth varies considerably, depending upon the soils and the kinds of trees and shrubs planted. Fertility, available moisture capacity, texture, and depth are soil characteristics that affect growth. Rainfall, exposure, and arrangement of trees and shrubs in the windbreak also affect growth. Redcedar grows almost a foot a year and reaches a height of 25 to 35 feet at maturity. Pines and broadleaf trees grow a little faster and a little taller. Some trees, cottonwood for example, grow fast but die young. Siberian elm and Russian-olive grow fast but spread where they are not wanted and may die young. Boxelder freezes in severe winters, and green ash is subject to heavy damage by the ash borer.

A windbreak must be designed for a specific purpose, and it must be adapted to the soils of the site. Information on the design, establishment, and maintenance of windbreaks can be obtained from the Soil Conservation Service and Extension Service in the county.

The soils of Hitchcock County have been grouped according to characteristics that affect tree growth. The group to which each soil belongs is shown at the end of each soil description in the section "Descriptions of the Soils" and is listed in the "Guide to Mapping Units." Following are brief descriptions of the windbreak groups and the trees and shrubs suitable for them. The hazards or limitations for each group are also given. In addition to the hazards peculiar to each group, drought is a hazard throughout the county.

SILTY TO CLAYEY WINDBREAK GROUP

This group consists of deep, well-drained soils. Most are silty. Some are loamy. Erosion in sloping areas and competition for moisture are the chief hazards on these soils. Suitable trees are eastern redcedar, ponderosa pine, Rocky Mountain juniper, Austrian pine, Scotch pine, arborvitae, honeylocust, hackberry, green ash, bur oak, American elm, Siberian elm, Russian mulberry, and Russian-olive. Suitable shrubs are boxelder, lilac, honey-

suckle, chokecherry, buffaloberry, American plum, Nemaha plum, and cotoneaster.

SANDY WINDBREAK GROUP

This group consists of slightly sandy, level to gently sloping soils and sandy, nearly level soils. Erosion and competition for moisture are the chief hazards. Suitable trees are eastern redcedar, Rocky Mountain juniper, ponderosa pine, Austrian pine, Scotch pine, honeylocust, green ash, Siberian elm, and Russian mulberry. Suitable shrubs are boxelder, American plum, lilac, sandcherry, chokecherry, and buffaloberry.

VERY SANDY WINDBREAK GROUP

In this group are very sandy soils and loose sandy soils that cannot be cultivated without risk of erosion.

Erosion and competition for moisture are the chief hazards. Suitable trees are eastern redcedar and ponderosa pine.

MODERATELY WET WINDBREAK GROUP

This group is made up of soils on bottom lands and terraces and in upland depressions that are wet occasionally because of a high water table or flooding. Wetness, competition for moisture, and water erosion in sloping areas, are the chief hazards. Suitable trees are eastern redcedar, Austrian pine, honeylocust, green ash, cottonwood, diamond willow, golden willow, white willow, Siberian elm, Russian mulberry, and Russian olive. Suitable shrubs are boxelder, lilac, buffaloberry, chokecherry, American plum, and cotoneaster.

WET WINDBREAK GROUP

This group consists of soils on bottom lands and terraces and in upland depressions that are wet most of the time because of a high water table, flooding, or poor drainage. Competition for moisture, water erosion in sloping areas, and wetness are the chief hazards. Suitable trees are golden willow, white willow, diamond willow, and red-osier dogwood. Buffaloberry is a suitable shrub.

MODERATELY SALINE OR ALKALI WINDBREAK GROUP

In this group are moderately saline and moderately alkali soils. Competition for moisture, erosion in sloping areas, and salinity or alkalinity of the soils are the chief hazards. Suitable trees are eastern redcedar, Siberian elm, green ash, honeylocust, cottonwood, diamond willow, Russian-olive, and tamarisk. Skunkbush sumac and buffaloberry are suitable shrubs.

Management of the Soils for Wildlife and Recreation [4]

The soils of Hitchcock County provide habitat for many kinds of wildlife. Pheasants, bobwhite quail, cottontail rabbits, fox squirrels, and deer, predominantly mule deer, are important as game. Migratory waterfowl use Swanson Lake in spring and fall. A good population of game fish, including bass, crappie, walleye, bluegill, and catfish, live in reservoirs and in the larger streams.

[4] By R. J. LEMAIRE, biologist, Soil Conservation Service.

TABLE 3.—*Potential of soil associations for wildlife habitat*

[Dashes mean not applicable]

Soil association	Wildlife	Potential for producing—			
		Woody plants [1]	Herbaceous plants [2]	Food [3]	Aquatic habitat
Keith-Goshen association.	Pheasant	Good	Very good	Very good	----
	Cottontail	Good	Good	Good	----
	Deer	Good	Good	Good	----
Colby association.	Pheasant	Fair	Fair	Fair	----
	Deer	Fair	Fair	Fair	----
Valentine-Anselmo association.	Pheasant	Fair	Good	Fair	----
	Deer	Fair	Good	Fair	----
Bridgeport-McCook-Duroc association.	Pheasant	Good	Very good	Very good	----
	Bobwhite quail	Good	Good	Good	----
	Deer	Good	Good	Good	----
	Cottontail	Good	Good	Good	----
	Squirrel	Good	----	Good	----
Sandy alluvial land-Haverson-Las association.	Pheasant	Fair	Fair	Fair	----
	Bobwhite quail	Good	Good	Fair	----
	Deer	Very good	Good	Good	----
	Cottontail	Good	Good	Good	----
	Squirrel	Good	----	Good	----
	Furbearers [4]	Very good	----	Very good	Good.
	Waterfowl	----	----	----	Good.
	Fish	----	----	----	Good.

[1] Elm, chokecherry, ceanothus, plum, rose, grape, and mulberry.
[2] Sunflower, clover, meadow salsify, ragweed, sagewort, and gromwell.
[3] Corn, wheat, and sorghum.
[4] Beaver, muskrat, and mink.

Beavers, muskrats, raccoons, and waterfowl live in the valleys of the Republican River, the Frenchman River, and other streams.

The kind of wildlife that can live in an area depends largely on the vegetation. The vegetation in this county is grass and some woodland. Most of the woodland is on bottom lands along the Republican River, the Frenchman River, and their tributaries.

Soil fertility, drainage, and water-holding capacity determine the kind and abundance of vegetation and wildlife in an area. Topography also is important, for it can determine land use. Soils too steep for cultivation can be used for wildlife habitat. Drainage and water-holding capacity are important in selecting sites for ponds, and wet soils can be used as habitat for waterfowl and furbearers.

In table 3 the soil associations are rated according to their potential for aquatic habitat and for producing cover and food for wildlife. The soil associations are described in the section "General Soil Map."

The wildlife and other natural resources of the county provide many recreational opportunities. Swanson Lake, the Republican River, and the Frenchman River are used for swimming, fishing, and boating, and there are areas suitable for picnicking, hunting, camping, nature study, and other forms of outdoor recreation.

Management of the Soils for Engineering[5]

Soil properties are important in engineering because soil is used as material in the construction and maintenance of highways, airports, building foundations, soil and water conservation systems, sewage disposal systems, and other engineering works.

Texture, permeability, shear strength, plasticity, moisture-density relationships, compressibility, and water-holding capacity are properties that affect engineering. Topography, depth to the water table, and depth to bedrock, sand, or gravel are also important.

The information in this survey can be used to:

1. Make studies that will aid in selecting and developing industrial, business, residential, and recreational sites.
2. Make preliminary estimates of the properties of soils in planning drainage systems, farm ponds, irrigation systems, and similar structures.
3. Make preliminary evaluations that will aid in selecting locations for highways and airports and in planning detailed investigation of the site.
4. Estimate the size of drainage areas and the speed and volume of runoff in designing culverts and bridges.
5. Identify the soils along proposed routes for highways, so that preliminary estimates can be made of the thickness required for flexible pavements.
6. Estimate the amount of clay needed to stabilize the surface of unpaved roads.
7. Locate sand, gravel, rock, mineral filler, and soil binder for use in subbase courses, base courses, and surface courses of flexible pavements.
8. Make preliminary evaluations of topography, surface drainage, subsurface drainage, height of water table, and other features that affect the design of highway embankments, subgrades, and pavements.
9. Correlate performance of engineering structures with soil mapping units and thus develop information that can be used in designing and maintaining these structures.
10. Determine the suitability of soils for cross-country movement of vehicles and construction equipment.
11. Supplement information from other sources and make engineering maps and reports.

With the use of the soil map for identification, the engineering interpretations reported here can be useful for many purposes. It should be emphasized that they do not eliminate the need for sampling and testing at the site of specific engineering works involving heavy loads or excavations deeper than the depth of layers here reported. Even in these situations, the soil map is useful for planning more detailed field investigations and for suggesting the kinds of problems that can be expected.

The terminology in this publication is that used by soil scientists. Some of the terms may differ in meaning from the same terms used by engineers. The more common terms are defined in the Glossary

Most of the information in this section is in table 4, "Engineering test data," table 5, "Estimated engineering properties of the soils," and table 6, "Engineering interpretations of the soils." Engineers may want to refer also to the sections "Descriptions of the Soils" and "Formation and Classification of the Soils."

Engineering Classification Systems

Two systems of soil classification are in general use by engineers. One is the system used by the American Association of State Highway Officials (AASHO) (*1*), and the other is the Unified system, which was developed by the U.S. Army Corps of Engineers (*10*). Estimated classifications of all the soils according to these two systems and according to the textural classification used by the U.S. Department of Agriculture are shown in table 5.

The AASHO system is based on field performance and on gradation, liquid limit, and plasticity index. In this system soils are placed in seven groups, ranging from A–1 through A–7. Soils in the A–1 group are gravelly and have high bearing capacity; those in the A–7 group are clayey and have low bearing capacity when wet. The relative engineering values of the soils within each group are indicated by group index numbers, which range from 0 for the best material to 20 for the poorest. The group index of a soil can be established only by laboratory tests. The AASHO classifications in table 4, Engineering test data, include group index numbers for the soils tested.

The Unified system is based on the texture and plasticity of the soils, as well as on their performance. Three

[5] By H. Glen Buchta, area engineer, and Ronald R. Hoppes, soil scientist, Soil Conservation Service, with the assistance of Lee E. Smedley, assistant State conservation engineer, Soil Conservation Service.

TABLE 4.—

[Tests performed by the Nebraska Department of Roads in cooperation with Bureau of Public Roads (BPR)

Soil name and location	Parent material	Nebraska report No. S63	Depth	Moisture-density data [1]	
				Maximum dry density	Optimum moisture
			In.	*Lb. per cu. ft.*	*Pct.*
Anselmo fine sandy loam: 100 feet N. and 0.2 mile W. of SE. corner sec. 26, T. 2 N., R. 35 W.	Windblown sand mixed with silt.	8440	0–6	118	12
		8441	17–27	120	12
		8442	42–60	120	11
Bridgeport silt loam: 0.1 mile S. and 100 feet W. of NE. corner sec. 10, T. 3 N., R. 32 W.	Colluvium.	8443	0–7	106	19
		8444	15–27	108	17
		8445	27–60	109	18
Colby silt loam: 0.25 mile E. and 0.3 mile S. of NW. corner sec. 33, T. 3 N., R. 31 W.	Peorian loess.	8446	6–10	106	18
		8447	10–60	110	17
Duroc silt loam: 0.25 mile W. and 100 feet S. of NE. corner sec. 14, T. 3 N., R. 31 W.	Old colluvium.	8454	0–6	104	20
		8455	18–33	110	18
		8456	40–60	111	17
Goshen silt loam: [5] 0.49 mile N. and 0.1 mile W. of SE. corner sec. 32, T. 3 N., R. 34 W.	Peorian loess.	8451	0–6	105	19
		8452	12–22	104	19
		8453	34–60	107	19
Keith silt loam: 0.2 mile S. and 110 feet E. of NW. corner sec. 13, T. 1 N., R. 34 W. (Modal).	Loess.	257	0–9	104	18
		258	9–23	105	18
		259	33–60	107	18
McCook loam: 0.3 mile E. and 0.2 mile S. of NW. corner sec. 17, T. 2 N., R. 34 W.	Alluvium.	8448	0–6	111	15
		8449	6–14	109	17
		8450	26–35	110	17
Ulysses silt loam: 0.35 mile S. and 50 feet E. of the NW. corner sec. 17, T. 3 N., R. 34 W.	Peorian loess.	8457	0–4	107	18
		8458	4–8	104	20
		8459	11–36	107	19
Valentine fine sand: 0.15 mile S. and 0.1 mile E. of the NW. corner sec. 25, T. 2 N., R. 35 W.	Windblown sand.	8460	2–5	114	10
		8461	5–60	108	14

[1] Based on AASHO Designation: T. 99–57, Method A (*1*).

[2] Mechanical analysis according to AASHO Designation: T. 88–57 (*1*). Results by this procedure may differ somewhat from results obtained by the soil survey procedure of the Soil Conservation Service (SCS). In the AASHO procedure, the fine material is analyzed by the hydrometer method and the various grain-size fractions are calculated on the basis of all the material including that coarser than 2 millimeters in diameter. In the SCS procedure, the fine material is analyzed by the pipette method and the material coarser than 2 mil-

Engineering test data

in accordance with standard procedures of the American Association of State Highway Officials (AASHO) (*1*)]

Mechanical analysis [2]							Liquid limit	Plasticity index	Classification	
Percentage passing sieve—			Percentage smaller than—						AASHO	Unified [3]
No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)	0.05 mm.	0.02 mm.	0.005 mm.	0.002 mm.				
							Pct.			
100	93	47	24	14	10	8	[4] NP	[4] NP	A-4(2)	SM.
100	93	45	27	15	11	9	22	2	A-4(2)	SM.
100	90	36	21	12	9	7	NP	NP	A-4(0)	SM.
	100	98	82	32	18	14	31	8	A-4(8)	ML-CL.
	100	95	70	26	14	12	29	6	A-4(8)	ML-CL.
	100	97	90	32	17	11	30	7	A-4(8)	ML-CL.
	100	90	62	19	8	6	28	4	A-4(8)	ML-CL.
	100	97	83	28	8	4	28	2	A-4(8)	ML.
100	99	96	70	41	20	12	34	10	A-4(8)	ML-CL.
100	97	91	81	40	26	18	36	14	A-6(10)	CL.
100	99	86	72	33	20	15	28	8	A-4(8)	CL.
	100	96	72	35	17	11	30	6	A-4(8)	ML-CL.
	100	98	76	44	28	11	40	17	A-6(11)	CL.
	100	97	74	36	15	10	31	8	A-4(8)	ML-CL.
	100	97	86	46	26	21	31	8	A-4(8)	ML-CL.
	100	98	89	52	33	28	37	16	A-6(10)	CL.
	100	98	83	45	23	17	29	7	A-4(8)	ML-CL.
100	99	81	44	21	12	8	26	4	A-4(8)	ML-CL.
	100	92	60	34	22	14	33	11	A-6(8)	ML-CL.
	100	91	58	39	16	12	30	7	A-4(8)	ML-CL.
	100	99	70	32	17	11	30	7	A-4(8)	ML-CL.
	100	97	71	41	26	21	42	18	A-7-6(12)	ML-CL.
	100	98	70	38	19	13	32	9	A-4(8)	ML-CL.
100	97	29	18	8	5	5	NP	NP	A-2-4(0)	SM.
100	98	18	8	5	5	4	NP	NP	A-2-4(0)	SM.

limeters in diameter is excluded from calculations of grain-size fractions. The mechanical analysis used in this table is not suitable for use in naming textural classes.

[3] SCS and BPR have agreed that all soils having plasticity indexes within two points of A-line are to be given a borderline classification, such as ML-CL.

[4] NP=Nonplastic.

[5] This sample is from a normal profile of Goshen silt loam in a body that is too small to show separately on a map of the scale used and for that reason is included in an area mapped as Keith silt loam.

TABLE 5.—*Estimated*

[Properties of some miscellaneous land

Map symbol	Soil	Underlying material [1]	Depth to water table	Depth to bedrock, sand, or gravel-sand mixture	Depth from surface
			Feet	*Feet*	*Inches*
An AnA AnB AnC	Anselmo fine sandy loam, 0 to 1 percent slopes. Anselmo fine sandy loam, 1 to 3 percent slopes. [2] Anselmo fine sandy loam, 3 to 5 percent slopes. Anselmo fine sandy loam, 5 to 9 percent slopes.	Sand and silt	10+	([3])	0–34 34–60
AoAW AoBW	Anselmo loamy fine sand, 0 to 3 percent slopes. [2] Anselmo loamy fine sand, 3 to 7 percent slopes.	Sand and silt	10+	([3])	0–14 14–24 36–60
BcA	Bankard loamy fine sand.	Sand and gravel	6	4	0–14 14–50 50–60
Bf BfA	Bayard fine sandy loam, 0 to 1 percent slopes. Bayard fine sandy loam, 1 to 3 percent slopes. [2]	Sand and silt	10+	([3])	0–27 27–60
Bw	Bayard loam, 0 to 1 percent slopes.	Sand and silt	10	([3])	0–13 13–54 54–60
BfA2	Bayard loamy fine sand, hummocky.	Sand and silt	10+	([3])	0–6 6–27 27–60
Br BrA BrB	Bridgeport silt loam, 0 to 1 percent slopes. [2] Bridgeport silt loam, 1 to 3 percent slopes. Bridgeport silt loam, 3 to 7 percent slopes.	Silt	10+	([3])	0–60
Sy	Broken alluvial land.	Stratified sand and silt	10+	([3])	--------
CbCW CbD	Colby silt loam, 7 to 9 percent slopes. Colby silt loam, 9 to 30 percent slopes. [2]	Silt (Peorian)	10+	([3])	0–60
2Dc	Duroc silt loam, terrace, 0 to 1 percent slopes. [2]	Silt	10	([3])	0–6
2DcA	Duroc silt loam, terrace, 1 to 3 percent slopes.				6–60
DVC	Dwyer-Valentine loamy fine sands, 3 to 17 percent slopes. (See Valentine soil for Valentine part).	Sand	10+	([3])	0–18 18–60
Gd 2Gd	Glenberg fine sandy loam. [2] Glenberg fine sandy loam, saline-alkali.	Sand	10	([3])	0–28 28–48 48–60
Gh	Goshen silt loam, 0 to 1 percent slopes.	Silt (Peorian)	10+	([3])	0–16 16–26 26–60
Hf 2HL	Haverson fine sandy loam. Haverson and Las loams, saline-alkali. (See Las soil for Las part).	Stratified silt and sand	10	([3])	0–5 5–22 22–48
Hd	Hord silt loam, 0 to 1 percent slopes.	Silt (Peorian)	10+	([3])	0–60
KeA KeAW KeB KeB2 KG	Keith silt loam, 1 to 3 percent slopes. [2] Keith silt loam, 1 to 3 percent slopes, eroded. Keith silt loam, 3 to 7 percent slopes. Keith silt loam, 3 to 7 percent slopes, eroded. Keith and Goshen silt loams, 0 to 1 percent slopes. (See Goshen soil for Goshen part).	Silt (Peorian)	10+	([3])	0–10 10–24 24–60
	Las loam.	Stratified silt and sand	2	([3])	0–10 10–33 33–60

See footnotes at end of table.

engineering properties of the soils

types were too variable to be estimated]

Classification			Percentage passing sieve—			Permeability	Available water capacity	Shrink-swell potential
USDA	Unified	AASHO	No. 4	No. 10	No. 200			
						Inches per hour	*Inches per inch of soil*	
Fine sandy loam	SM	A-4		100	40–50	2.5–5.0	0.15	Low.
Loamy fine sand	SM	A-4	100	98–100	35–45	5.0–10.0	0.10	Low.
Loamy fine sand	SM	A-2		100	25–35	5.0–10.0	0.10	Low.
Fine sandy loam	SM	A-4		100	40–50	2.5–5.0	0.15	Low.
Sand	SP–SM or SM	A-2	100	95–100	10–20	5.0–10.0	0.06–0.08	None.
Loamy fine sand	SM	A-2		100	25–35	5.0–10.0	0.10	Low.
Fine sand	SP–SM or SM	A-3 or A-2		100	5–15	5.0–10.0	0.06–0.08	None.
Sand and gravel	SP or SP–SM	A-3	100	75–95	0–10	10.0+	0.06	None.
Fine sandy loam	SM	A-4		100	35–50	2.5–5.0	0.15	Low.
Fine sand	SP–SM or SM	A-3 or A-2		100	5–15	5.0–10.0	0.06–0.08	None.
Loam	ML	A-2		100	60–75	0.8–2.5	0.16	Low.
Fine sandy loam	SM	A-2 or A-4		100	35–50	2.5–5.0	0.15	Low.
Sand	SP–SM or SM	A-2	100	95–100	10–20	5.0–10.0	0.06–0.08	None.
Loamy fine sand	SM	A-2		100	25–35	5.0–10.0	0.10	Low.
Fine sandy loam	SM	A-4		100	35–50	2.5–5.0	0.15	Low.
Loamy fine sand	SM	A-2		100	25–35	5.0–10.0	0.10	Low.
Silt loam	ML or CL	A-4		100	90–100	0.8–2.5	0.16	Low.
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Silt loam	ML or CL	A-4		100	85–100	0.8–2.5	0.16	Low.
Silt loam	ML or CL	A-4 or A-6		100	90–100	0.8–2.5	0.16	Low to moderate.
Silt loam	CL	A-4 or A-6		100	80–100	0.8–2.5	0.16	Low to moderate.
Loamy fine sand	SM	A-2	100	98–100	25–35	5.0–10.0	0.10	None.
Fine sand	SP–SM or SM	A-2	100	95–100	10–20	5.0–10.0	0.06–0.08	None.
Fine sandy loam	SM	A-2 or A-4		100	30–40	2.5–5.0	0.15	Low to none.
Loamy very fine sand	SM	A-2	100	95–100	20–30	5.0–10.0	0.10	Low to none.
Sand	SP–SM or SM	A-2	100	95–100	10–20	5.0–10.0	0.06–0.08	None.
Silt loam	ML or CL	A-4		100	95–100	0.8–2.5	0.16	Low.
Heavy silt loam or silty clay loam.	ML or CL	A-6 or A-7		100	95–100	0.2–0.8	0.17	Moderate.
Silt loam	ML or CL	A-4		100	95–100	0.8–2.5	0.16	Low.
Fine sandy loam	SM	A-4		100	35–50	2.5–5.0	0.15	Low to none.
Loam or sandy loam	ML to CL	A-4		100	85–95	0.8–2.5	0.16	Low.
Silt loam	ML to CL	A-4		100	90–100	0.8–2.5	0.16	Low.
Silt loam	ML	A-4		100	85–100	0.8–2.5	0.16	Low.
Silt loam	ML or CL	A-4		100	95–100	0.8–2.5	0.16	Low.
Silt loam	CL	A-6		100	95–100	0.8–2.5	0.16	Moderate.
Silt loam	ML or CL	A-4		100	95–100	0.8–2.5	0.16	Low.
Loam	ML or CL	A-4		100	85–95	0.8–2.5	0.16	Low.
Loam or very fine sandy loam.	ML or CL	A-4		100	85–95	0.8–2.5	0.16	Low.
Sand	SP–SM or SM	A-3 or A-2	100	95–100	5–15	5.0–10.0	0.06–0.08	None.

TABLE 5.—*Estimated engineering*

Map symbol	Soil	Underlying material [1]	Depth to water table	Depth to bedrock, sand, or gravel-sand mixture	Depth from surface
			Feet	*Feet*	*Inches*
Mb 2Mb	McCook loam. [2] McCook loam, overflow.	Silt	10+	(3)	0–6 6–60
4Mb	McCook loam, sand substratum variant.	Silt and sand	6	4	0–30
					30–60
Pt	Platte loam.	Sand and gravel	0	1	0–7
					7–12 12–42
BCa	Rough broken land, caliche.	Limy sandstone (Ogallala)	10+	0–2	
BL	Rough broken land, loess.	Silt (Peorian)	10+	(3)	0–60
Sx	Sandy alluvial land.	Stratified sand and gravel	2	2–4	0–8 8–60
Sc	Scott silt loam.	Silt (Peorian)	10+	(3)	0–6 6–48
					48–60
Ss	Slickspots.	Silt and sand	4	(3)	0–6 6–18 18–48 48–60
UsB2 UsC	Ulysses silt loam, 3 to 7 percent slopes, eroded.[2] Ulysses silt loam, 7 to 9 percent slopes.	Silt (Peorian)	10+	(3)	0–4 4–8
UsC2	Ulysses and Colby silt loams, 7 to 9 percent slopes, eroded. (See Colby soil for Colby part).				11 36
VaC	Valentine fine sand, rolling.	Sand	10+	(3)	2–5 5–60

[1] Material generally at a depth between 4 and 10 feet.
[2] Classification and properties are for this phase. Soils in this group are nearly uniform in properties listed except for runoff, slope, and degree of erosion.

soil fractions are recognized—gravel, sand, and fines (silt and clay). Soils are classified as coarse grained (eight classes), fine grained (six classes), and highly organic (one class) according to their content of the three soil fractions. A letter symbol indicates the principal characteristics of the soils. The coarse-grained soils are gravel (G) and sand (S), and each of these is divided into four secondary groups. The fine-grained soils are silt (M) and clay (C), depending on their liquid limit and plasticity index. The silt and clay groups are each divided into secondary groups according to whether the soils have low (L) or high (H) liquid limit. The highly organic soils (Pt) are generally very compressible and have undesirable construction characteristics.

Engineering Test Data

Table 4 shows engineering test data for nine soil types that were sampled and tested by the Division of Materials and Tests, Nebraska Department of Roads, according to standard AASHO procedures. The samples taken were of natural horizons.

Moisture-density data in table 4 were obtained by mechanical compaction. If soil material is compacted at successively higher moisture content and the compaction effort remains constant, the density of the compacted material increases until the optimum moisture content is reached. After that, the density decreases with increase in moisture content. The highest dry density obtained in the compaction test is the maximum dry density. Moisture-density data are important in earthwork, for, as a rule, soil is most stable if it is compacted to the maximum dry density when it is at the optimum moisture content.

The mechanical analysis was made by a combination of the sieve and hydrometer methods. The percentages of clay obtained by the hydrometer method should not be used in naming textural classes of soils. The classifica-

properties of the soils—Continued

Classification			Percentage passing sieve—			Permeability	Available water capacity	Shrink-swell potential
USDA	Unified	AASHO	No. 4	No. 10	No. 200			
						Inches per hour	*Inches per inch of soil*	
Loam	ML	A–4		100	75–85	0.8–2.5	0.16	Low.
Silt loam to very fine sandy loam.	ML or CL	A–4 or A–6		100	85–95	0.8–2.5	0.16	Low to moderate.
Loam	ML or CL	A–4 or A–6		100	85–95	0.8–2.5	0.16	Low to moderate.
Sand	SP–SM or SM	A–2	100	95–100	10–20	5.0–10.0	0.06–0.08	None.
Silt loam	ML or CL	A–4 or A–6		100	80–100	0.8–2.5	0.16	Low to moderate.
Loamy sand	SM	A–2	100	95–100	15–25	5.0–10.0	0.10	None.
Sand and gravel	SP or SP–SM	A–3	90–100	75–85	0–10	10.0+	0.06	None.
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Silt loam	ML to CL	A–4		100	90–100	0.8–2.5	0.16	Low.
Fine sand	SP–SM or SM	A–3 or A–2		100	5–15	5.0–10.0	0.07	None.
Sand and gravel	SP or SP–SM	A–3	90–100	75–85	0–10	10.0+	0.06	None.
Silt loam	ML	A–4		100	90–100	0.8–2.5	0.16	Low.
Silty clay and silty clay loam.	CH	A–7		100	95–100	0.05–0.20	0.18	Moderate to high.
Silt loam	ML or CL	A 4		100	95–100	0.8–2.5	0.16	Low.
Loam	ML	A–4		100	70–85	0.8–2.5	0.16	Low.
Clay loam	CL or CH	A–7		100	85–95	0.05–0.20	0.18	High.
Loam	ML	A–4		100	75–85	0.8–2.5	0.16	Low.
Sand	SP–SM or SM	A–2 or A–3	100	95–100	5–15	5.0–10.0	0.06–0.08	None.
Silt loam	ML or CL	A–4		100	95–100	0.8–2.5	0.16	Low.
Silt loam	ML or CL	A–6 or A–7		100	95–100	0.8–2.5	0.16	Moderate to high.
Silt loam	ML or CL	A–4		100	95–100	0.8–2.5	0.16	Low.
Fine sand	SM	A–2	100	100	15–25	5.0–10.0	0.10	None.
Fine sand	SM	A–2	100	100	5–15	5.0–10.0	0.06–0.08	None.

[3] Bedrock, sand, or gravel occurs below the normal sampled depth.

tions in the last two columns of table 4 are based on data obtained by mechanical analysis and on tests made to determine liquid and plastic limits.

The tests for liquid limit and plastic limit measure the effect of water on the consistence of the soil material. As the moisture content of a clayey soil increases from a very dry state, the material changes from semisolid to plastic and from plastic to liquid. The plastic limit is the moisture content, expressed as a percentage of the ovendry weight, at which the soil material passes from a semisolid to a plastic state. The liquid limit is the moisture content at which the material passes from plastic to liquid. The plasticity index is the numerical difference between the liquid limit and the plastic limit. It indicates a range of moisture content within which a soil material is in a plastic condition. Some silty and sandy soils are nonplastic; they do not become plastic at any moisture content.

Estimated Engineering Properties of the Soils

Table 5 shows estimated engineering properties of the soils based on test data in table 4 and on information given in other sections of this publication. The soil properties referred to are defined here.

Permeability is the quality that enables a soil to transmit water and air. It depends upon the texture and structure of the soil. It is expressed as the rate at which water percolates through undisturbed soil material and is measured in inches per hour.

Available water capacity, which generally is expressed in inches of water per inch of soil depth, is the amount of water held available to plants. It is the difference between the amount of water in a soil at field capacity and the amount at the permanent wilting point.

Shrink-swell potential generally depends on the texture of a soil. The shrink-swell potential is high for plastic soils that have a high silt and clay content and low or

TABLE 6.—*Engineering*

[Properties of some miscellaneous land

Soil series and map symbols	Suitability— As source of— Topsoil	Suitability— As source of— Sand	Suitability— Of material for— Road subgrade: Paved	Suitability— Of material for— Road subgrade: Gravel	Suitability— Of material for— Road fill	Soil properties affecting— Highway location	Soil properties affecting— Foundations [1]	Soil properties affecting— Dikes and levees
Anselmo (An, AnA, AnB, AnC, AoAW, AoBW).	Fair to poor: erodible; sandy.	Good to poor: well graded.	Good to poor	Good to fair	Good to poor	Moderate erodibility; moderate susceptibility to frost action.	Good to poor bearing capacity; fair shear strength; piping.	Moderate to severe piping; unstable; flat slopes required.
Bankard (BcA)	Poor: unstable.	Good	Good	Poor	Good	Loose sand hinders hauling; slight susceptibility to frost action; erodibility on slopes.	Good bearing capacity if material is confined; good shear strength.	Unstable; piping
Bayard (Bf, BfA, BfA2, Bw).	Fair	Unsuitable	Good to poor	Fair to poor	Good to poor	Moderate erodibility on embankments and back slopes; moderate susceptibility to frost action.	Fair to good bearing capacity; fair shear strength.	Unstable; piping
Bridgeport (Br, BrA, BrB)	Good to fair	Unsuitable	Fair to poor	Good to fair	Fair to poor	Erodibility on slopes; high to very high susceptibility to frost action.	Fair to poor bearing capacity and shear strength.	Moderate hazard of piping; erodibility on slopes; protection required in places.
Broken alluvial land (Sy)								
Colby (CbCW, CbD)	Fair	Unsuitable	Fair to poor	Good to fair	Fair to poor	Erodibility on slopes; high to very high susceptibility to frost action.	Fair to poor bearing capacity and shear strength.	Not applicable
Duroc (2Dc, 2DcA)	Good	Unsuitable	Fair to poor	Good to fair	Fair to poor	Moderate to high susceptibility to frost action; erodibility on slopes.	Fair bearing capacity; moderate piping.	Piping in places; moderate erodibility on slopes.
Dwyer (DVC) (For Valentine part, see Valentine series.)	Poor: sandy	Good for fine sand below a depth of 1 foot.	Good to fair	Poor	Good to fair	Loose sand; low susceptibility to frost action; severe erodibility; difficult to vegetate.	Good bearing capacity; fair to good shear strength.	Not applicable
Glenberg (Gd, 2Gd)	Fair	Good: fine to medium sand below a depth of 4 feet.	Good to poor	Good to poor	Good to poor	Moderate erodibility on embankments and back slopes; infrequent flooding; minimum fill may be required; moderate susceptibility to frost action.	Good to poor bearing capacity, depending on density; fair shear strength.	Piping in places; erodibility on slopes.
Goshen (Gh)	Good	Unsuitable	Fair to poor	Good to fair	Fair to poor	High or very high susceptibility to frost action; erodibility on slopes.	Poor to fair bearing capacity; fair shear strength.	Not applicable

See footnote at end of table.

interpretations of the soils

types were too variable for interpretation]

Soil properties affecting—Continued						Soil limitations for sewage disposal	
Low dams		Agricultural drainage	Irrigation	Terraces and diversions		Septic tanks and filter beds	Sewage lagoons
Reservoir	Embankment						
Rapid seepage	Piping; low compressibility; fair stability; toe drains required in places; difficult to vegetate.	Not needed	Moderately rapid permeability; moderate water-holding capacity.	Moderately rapid permeability; severe susceptibility to erosion by wind and water. Maintenance is a problem in places.		Slight	Severe: moderately rapid permeability; embankment subject to piping in places.
Not applicable	Not applicable	Not needed	Low water-holding capacity; rapid intake rate; low fertility.	Not applicable		Moderate: infrequent flooding.	Severe: rapid permeability; poor compaction characteristics.
Rapid seepage	Fair stability; piping; toe drains required in places; protection of slopes required.	Not needed	Moderate water-holding capacity.	Severe erodibility; maintenance may be costly.		Slight	Severe: moderately rapid to rapid permeability; piping.
Moderate seepage	Poor to fair stability; close control of moisture required; toe drains required in places.	Not needed	Moderate water-holding capacity.	Severe erodibility; channels subject to siltation; good maintenance necessary.		Slight	Moderate: moderate permeability; moderate hazard of piping in places.
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Moderate seepage	Fair to poor stability; fair to good compaction characteristics if moisture is controlled; toe drains required in places.	Not needed	Moderate water-holding capacity; erodibility on steeper slopes.	Severe erodibility; channels subject to siltation; maintenance may be costly.		Moderate to severe: moderate permeability; steep slopes.	Moderate to severe: moderate permeability; moderate to steep slopes.
Moderate to slow seepage.	Fair stability and compaction characteristics; moderate permeability when compacted; piping in places.	Not applicable	Moderate water-holding capacity; erodibility on slopes.	Slight erodibility		Slight	Moderate: moderate permeability.
Not applicable	Not applicable	Excessive drainage	Low water-holding capacity; rapid intake rate; erodibility.	Not applicable		Slight	Severe: rapid permeability; strong slopes.
Moderate to rapid seepage.	Fair to poor stability; piping; fair to good compaction characteristics.	Soil properties favorable.	Moderate to moderately low water-holding capacity.	Not applicable		Moderate: infrequent flooding.	Severe: moderately rapid to rapid permeability; piping.
Control of seepage generally not a problem.	Fair stability; fair to good compaction characteristics if moisture is controlled.	Not needed	Moderate water-holding capacity.	Slight erodibility		Slight	Moderate to severe: moderate permeability.

TABLE 6.—*Engineering*

Soil series and map symbols	Suitability— As source of— Topsoil	Sand	Of material for— Road subgrade: Paved	Road subgrade: Gravel	Road fill	Soil properties affecting— Highway location	Foundations[1]	Dikes and levees
Haverson (Hf, 2HL). (For Las part of 2HL, see Las series.)	Good	Unsuitable	Fair to poor	Good to poor	Fair to poor	Infrequent flooding; moderate to high susceptibility to frost action; minimum fill may be required.	Good to poor bearing capacity and shear strength.	Moderate piping; erodibility on slopes in places.
Hord (Hd)	Good	Unsuitable	Fair to poor	Good to fair	Fair to poor	High to very high susceptibility to frost action.	Poor bearing capacity; poor shear strength.	Not applicable
Keith (KeA, KeAW, KeB, KeB2, KG). (For Goshen part of KG, see Goshen series.)	Good	Unsuitable	Fair to poor	Good to fair	Fair to poor	High to very high susceptibility to frost action.	Fair bearing capacity and shear strength.	Not applicable
Las	Fair	Fair to good below a depth of 3 feet.	Good to poor	Good to poor	Good to poor	Flooding; high water table; minimum fill may be required; high to very high susceptibility to frost action.	Good to fair bearing capacity; fair shear strength.	Moderate piping
McCook (Mb, 2Mb)	Good	Unsuitable	Fair to poor	Good to fair	Fair to poor	High to very high susceptibility to frost action.	Fair to poor bearing capacity; fair shear strength.	Severe piping; severe erodibility.
McCook, variant (4Mb)	Good	Good below a depth of 3 feet.	Good to poor	Good to fair	Fair to good	High to very high susceptibility to frost action.	Good bearing capacity; fair to good shear strength.	Piping; erodibility on slopes.
Platte (Pt)	Poor: sandy and gravelly.	Unsuitable	Good to poor	Poor to good	Good to poor	High to very high susceptibility to frost action; 4 to 7 feet of fill required in places.	Good bearing capacity; high water table.	Severe piping; very unstable; severe erodibility.
Rough broken land (BCa, BL). (Interpretations are for BL, characteristics of BCa are variable.)	Poor: erodible	Unsuitable	Fair to poor	Good to fair	Fair to poor	High susceptibility to frost action.	Fair to poor bearing capacity and shear strength.	Not applicable
Sandy alluvial land (Sx)	Poor: erodible; sandy and gravelly.	Good	Good to fair	Poor to fair	Good to fair	Low susceptibility to frost action; high water table; minimum fill required in places.	Good bearing capacity if confined; good shear strength.	Unstable; erodibility on slopes; piping.
Scott (Sc)	Good	Unsuitable	Fair to poor	Good	Fair to poor	Low to moderate susceptibility to frost action; ponding; minimum fill required in places; erodibility on slopes.	Fair to poor bearing capacity and shear strength.	Erodibility on slopes.

See footnote at end of table.

interpretations of the soils—Continued

Soil properties affecting—Continued					Soil limitations for sewage disposal	
Low dams		Agricultural drainage	Irrigation	Terraces and diversions	Septic tanks and filter beds	Sewage lagoons
Reservoir	Embankment					
Slow seepage	Fair to poor stability; fair compaction characteristics.	Not needed	Moderate water-holding capacity.	Not applicable	Moderate: infrequent flooding.	Moderate to severe: moderate permeability; piping.
Moderate seepage	Poor stability and compaction characteristics; medium compressibility; piping.	Not needed	Moderate water-holding capacity; surface drainage for tail water needed in places.	Not applicable	Moderate: moderate permeability.	Moderate to severe: moderate permeability; dikes subject to piping in places.
Moderate seepage	Poor to good stability and compaction characteristics; medium to high compressibility; slow permeability when compacted.	Not needed	Moderate water-holding capacity; erodibility on gentle slopes.	Slight erodibility	Slight	Moderate to severe: slopes; moderate permeability.
High water table; suitable for dugouts in places.	Fair to good stability and compaction characteristics; slow permeability when compacted; medium to high compressibility.	Slow surface drainage; moderately slow internal drainage above a depth of 3 feet; outlets not available in places.	Somewhat poor drainage; moderately slow internal drainage; salts and alkalinity.	Not applicable	Severe: high water table.	Severe: rapid permeability below a depth of about 33 inches; dikes subject to piping in places.
Control of seepage generally not a problem.	Fair to poor stability and compaction characteristics; medium compressibility; slow permeability when compacted.	Not needed	Moderate water-holding capacity.	Not applicable	Slight	Moderate: moderate permeability; dikes subject to piping in places.
Water table may be at a depth of 6 feet; suitable for dugouts in places.	Not applicable	Not needed; infrequent flooding.	Low water-holding capacity; low fertility.	Not applicable	Slight	Severe: rapid permeability, especially below a depth of 3 feet.
High water table; suitable for dugouts in places.	Not applicable	High water table; medium to rapid internal drainage; outlets not available in places.	Low water-holding capacity; high water table; irrigation generally not feasible.	Not applicable	Severe: high water table.	Severe: rapid permeability below the surface layer.
Moderate seepage	Poor stability and compaction characteristics; moisture control needed; moderate permeability when compacted.	Excessive drainage	Not applicable	Not applicable	Severe: steep slopes	Severe: steep slopes.
High water table; suitable for dugouts in places.	Not applicable	High water table; medium to rapid internal drainage; outlets not available in places.	Not applicable	Not applicable	Moderate to severe: high water table; flooding.	Severe: rapid permeability.
Control of seepage not a problem; suitable for dugouts in places.	Not applicable	Slow internal drainage, especially in subsoil; outlets not available in places.	High water-holding capacity; slow intake rate; drainage needed.	Not applicable	Severe: slow permeability; ponding.	Slight.

TABLE 6.—*Engineering*

Soil series and map symbols	Suitability— As source of— Topsoil	Suitability— As source of— Sand	Suitability— Of material for— Road subgrade: Paved	Suitability— Of material for— Road subgrade: Gravel	Suitability— Of material for— Road fill	Soil properties affecting— Highway location	Soil properties affecting— Foundations [1]	Soil properties affecting— Dikes and levees
Slickspots (Ss)	Poor, large amount of clay; saline-alkali.	Fair below a depth of 4 feet.	Good to poor	Good to poor	Good to poor	Moderate susceptibility to frost action; water table rises to a depth of 4 feet; severe erodibility on slopes.	Fair to good bearing capacity; fair shear strength.	Piping in places; cracking.
Ulysses (UsB2, UsC, UsC2). (For Colby part of UsC2, see Colby series.)	Fair: erodible; large amount of clay.	Unsuitable	Fair to poor	Good to fair	Fair to poor	High susceptibility to frost action; erodibility on slopes in places.	Fair to poor bearing capacity and shear strength.	Not applicable
Valentine (VaC)	Poor: sandy	Good for fine sand below a depth of 1 foot.	Good to fair	Poor	Good to fair	Loose sand; low susceptibility to frost action; severe erodibility; difficult to vegetate.	Good bearing capacity; fair to good shear strength.	Not applicable

[1] Engineers and others should not apply specific values to the interpretations of bearing capacity in this column.

moderate for soils that have a moderate silt and clay content and a low to moderate plasticity index. In this county the only soil material that has a high shrink-swell potential occurs in some horizons of Slickspots. The shrink-swell potential is moderate to high at a depth of 6 to 48 inches in Scott silt loam and at a depth of 4 to 8 inches in Ulysses silt loam.

Table 5 does not give the reaction of soils in the county. The reaction generally ranges from pH 7.0 to pH 8.0 in the surface layer and from pH 7.5 to pH 8.5 in the lower horizons. Most of the soils are only slightly saline, and their content of soluble salts is 0.2 percent or less. Haverson and Las loams, saline-alkali, and Slickspots are higher in pH than other soils in the county. They contain variable amounts of excess sodium, soluble salts, or both. In Haverson and Las loams, saline-alkali, the reaction ranges from 8.8 to 9.5. In the Slickspots the reaction is as high as 10.0.

The rate of surface runoff depends on topography and on texture and other soil characteristics. Most soils of the county have slow or medium runoff because they are medium textured or moderately coarse textured and the rate of infiltration is generally moderate or moderately rapid.

Engineering Interpretations of the Soils

In table 6 the soils are rated as sources of topsoil and sand and as material for road subgrade and fill. Soil features are named that affect highway location, foundations, dikes and levees, low dams, drainage systems, irrigation systems, and terraces. Also listed are soil limitations for sewage disposal systems.

As a source of topsoil, many of the soils are poor or fair because they are eroded or are low in natural fertility or in content of organic matter. Even though a soil is a good source of sand, extensive exploration may be required to find material that has the gradation needed.

The soils are rated as subgrade material for bituminous or concrete paved roads and for gravel roads. Properly confined sand is the best subgrade for paved roads. The soil material is good if the AASHO classification is A–1 or A–3, good to fair if the classification is A–2, fair to poor if it is A–4, and poor if it is A–6 or A–7.

The ratings of soils as subgrade for gravel roads are for that part of the subgrade that receives the gravel surfacing. Silty or clayey soils classified as A–5, A–6, or A–7 are good subgrade material because they are acceptable for use in the upper part of the subgrade that is surfaced with gravel. A–4 soils and those A–2 soils that are adequately plastic are good to fair. All A–1 and A–3 soils and A–2 soils that are not adequately plastic are poor as subgrade material for gravel roads.

The ratings for road fill are based on about the same criteria as the ratings for subgrade under bituminous or concrete pavement.

Susceptibility to frost action is one of the factors that affects highway location. Frost action is a common but not a major problem in the county. The interpretations were made on the basis of the texture of the surface soil and subsoil. Clays and silts are susceptible to frost action if the underlying soil layers are pervious enough for water to rise and form ice lenses. In rating fine-grained soils that have a surface layer classified as ML, CL, or CH, the amount of clay material in the subsoil was considered. For example, if the surface layer is classified ML and the subsoil is less than 40 percent clay, the soil is rated *very high*. Uniform fine sands that have a surface layer classified as SM and that are less than 35 percent fines are rated *low* to *none*.

Soil properties that affect foundations are bearing capacity and susceptibility to piping. The material evalu-

interpretations of the soils—Continued

Soil properties affecting—Continued					Soil limitations for sewage disposal	
Low dams		Agricultural drainage	Irrigation	Terraces and diversions	Septic tanks and filter beds	Sewage lagoons
Reservoir	Embankment					
High water table; suitable for dugouts in places.	Not applicable	Slow internal drainage, especially in subsoil; outlets not available in places.	Slow intake rate; high water-holding capacity slow release to plants; drainage needed.	Not applicable	Moderate: slow to moderate permeability; high water table.	Severe: rapid permeability below a depth of 4 feet; high water table.
Moderate seepage	Fair stability; good compaction characteristics; moisture control needed.	Not applicable	Moderate water-holding capacity; erodibility on strong slopes.	Moderate erodibility	Slight	Moderate to severe: moderate permeability; strong slopes.
Not applicable	Not applicable	Excessive drainage	Low water-holding capacity; rapid intake rate; erodibility.	Not applicable	Slight	Severe: rapid permeability; strong slopes.

ated is that part of the profile below a depth of 3 feet. Engineers should not apply numerical values to the interpretations of bearing capacity.

The information given for dikes and levees applies only to the upper 18 inches of the soil.

Most reservoirs above small earth dams in this county lose water through seepage because they are on soils that have sandy or gravelly lower horizons. Sealing is needed to reduce the loss.

In compacted embankments, the soils are generally impervious and have good to poor stability. Toe drains may be required. Workability is generally good.

Agricultural drainage is needed because of poor internal drainage, flooding, and slow runoff. The feasibility and effectiveness of drainage systems are determined by soil permeability, a high water table, and the availability of drainage outlets.

Soil properties that affect irrigation are water-holding capacity and water intake rate. The interpretation for water-holding capacity is for the top 4 feet of soil. Water-holding capacity is *high* if the capacity is more than 8 inches in the top 4 feet, *moderate* if the capacity is 5 to 8 inches, *low* if it is 3 to 5 inches, and *very low* if it is less than 3 inches. Water intake rate is given only if the rate is rapid or slow. The intake rate is that amount of water that enters the soil, under sprinkler or border irrigation, when the soil has an alfalfa or grass cover. The rate is expressed in inches per hour. A slow intake rate is less than ½ inch per hour, and a rapid one is 2 inches or more per hour.

Irrigation hazards related to slope are not listed for all soils. The Nebraska Irrigation Guide for Central and Eastern Nebraska (*9*) contains information on the suitability of the soils for irrigation.

Level terraces are commonly used in this county to conserve soil and water. Diversion terraces are used in some places to protect lower lying areas, especially those downslope from grassland. Terrace slopes are erodible, but in most places the cost of maintenance is not high. The use of terraces is limited in some places by steep, irregular, or hummocky slopes.

The interpretations for sewage disposal have been made on the basis of permeability ratings and not on the basis of percolation tests. The short-term ability of a soil to transmit water is not necessarily a measure of its long-term ability to absorb sewage. Before construction of a septic tank and filter field system, percolation tests should be run and installations in similar soils should be studied. Also, consideration should be given to the proximity of wells and possible contamination of them. Besides permeability, some of the factors that affect suitability for sewage disposal are slope, a high water table, a hazard of flooding, and, for sewage lagoons, susceptibility to piping.

The soils have not been rated on suitability for waterways, because waterways are not extensively used in dryland farming. They are commonly used for water disposal on irrigated, contour-benched fields, and there are no special problems or hazards of construction and maintenance.

The suitability of the soils for winter grading is not rated in table 6. Whether or not a soil can be graded in winter depends on the moisture content of the soil and on temperature, both of which vary from year to year. Soils with a relatively high content of silt are predominant in the county. Therefore, few of the soils that receive moisture in the fall are adaptable to winter grading. Some soils on the bottom lands have a high water table or are subject to occasional flooding and generally cannot be graded in winter.

Formation and Classification of the Soils

This section contains a discussion of the soil-forming factors and an explanation of the current system of classifying soils in categories above the series level.

Formation of the Soils

Soil is formed by the interaction of five soil-forming factors—climate, living organisms, parent material, topography, and time. The influence of each factor varies from place to place. At any one place one or more factors may be dominant and fix the properties of a soil.

Soil-forming factors

Climate and living organisms act on parent material and slowly change it into a natural body with genetically related horizons. The effects of climate and vegetation are conditioned by topography. Parent material influences the kind of profile that can be formed and, in some cases, determines it almost entirely. Finally, time is needed for the changing of parent material into a soil.

Climate.—The climate of Hitchcock County is warm and semiarid and probably is about the same as when the soils were formed. It has promoted rapid soil development. It is uniform throughout the county, although the effect is modified locally by runoff. The differences among soils in this county are not due to climate.

Living organisms.—Plants, animals, insects, bacteria, and fungi are important in the formation of soil. They increase the supplies of organic matter and nitrogen, increase or decrease the supply of plant nutrients, and change the structure and porosity of soil. Vegetation, especially grass, has affected soil formation in Hitchcock County more than have other living organisms. The grass vegetation has produced soils that generally are medium in organic-matter content.

Parent material.—Parent material is the unconsolidated mass from which a soil forms. It determines the chemical and mineralogical composition of the soil. In Hitchcock County there are three kinds of parent material: Peorian loess, eolian sand, and alluvium. Each is in a particular geographic area.

Peorian loess forms a mantle over most of the uplands. It is windblown, calcareous, silty material derived from quartzite and feldspar. This material was first deposited in the Platte River valley and later carried to the uplands by wind. Keith and Colby are the main soils that formed in Peorian loess.

Eolian sand covers an area in the west-central part of the county south of the Republican River and a small area south of the Frenchman River and east of Palisade. Most of the sand is quartz; part of it is feldspar. This sand is believed to have been blown from the valleys of the Republican and Frenchman Rivers. It occurs as hummocks, or dunelike hills, characteristic of sandy areas. Soils form slowly in sand and are normally low in organic-matter content and in natural fertility. Anselmo and Valentine soils formed in eolian sand.

Alluvium is the parent material of soils on bottom lands of all the major drainageways. Alluvium varies in texture from silt to coarse sand. It was washed from the higher positions and deposited on bottomlands by rivers and streams. The largest area of alluvium is in the Republican River valley. Because deposits of alluvium are added from time to time, soils on bottom lands are young and do not have well-developed profiles. Also, they vary in profile characteristics over short distances because of differences in the source of parent material. Bankard, Las, Platte, and McCook soils formed in alluvium.

Topography.—Topography, or relief, affects soil formation by influencing drainage, erosion, plant cover, and soil temperature. The soils on bottom lands are normally nearly level, although small areas of the sandier soils occur as gently sloping ridges or hummocks. The soils on uplands are nearly level to steep.

Time.—Time, usually a long time, is required for soils to develop distinct horizons. The length of time that parent material has been in place is commonly reflected in the degree of profile development. The soils in Hitchcock County range from young to old. McCook soils are young, because new deposits of alluvium are laid down before soil development can take place. Keith soils are older and have distinct soil horizons. They have been in place long enough for climate, organisms, and topography to alter the original parent material.

Soil-forming processes

Four processes were involved in the formation of horizons in the soils of Hitchcock County. These processes are the accumulation of organic matter, the leaching of calcium carbonates and bases, the reduction and transfer of iron, and the formation and translocation of silicate clay minerals. In most soils, more than one of these processes has been active in the formation of horizons.

The accumulation of organic matter in the upper part of the profile to form an A1 horizon has been important. The soils of this county range from high to low in organic-matter content.

The leaching of carbonates and bases has occurred in nearly all of the soils. Generally the leaching of bases in soils precedes translocation of silicate clay minerals. Most of the soils on uplands are moderately leached.

In some of the soils, the translocation of clay minerals has contributed to horizon development. The eluviated A2 horizon has a platy structure, is lower in content of clay, and generally is lighter in color. The B horizon generally has an accumulation of clay (clay films) in pores and on peds. These soils were probably leached of carbonates and soluble salts to a considerable extent before the translocation of silicate clays. Scott is an example of these soils.

Classification of the Soils

Soils are classified so that we can assemble knowledge about them, more easily remember their significant characteristics, see their relationships to one another and to the whole environment, and understand their behavior and response to use. Through classification and through the use of soil maps, we can apply our knowledge of soils to specific fields and to counties and larger areas.

The soils of Hitchcock County have been classified according to the current system of classification (*5*), which has been used by the National Cooperative Soil

TABLE 7.—*Classification of soil series*

Series	Family	Subgroup	Order
Anselmo	Coarse-loamy, mixed, mesic	Typic Haplustoll	Mollisols.
Bankard	Sandy, siliceous, mesic	Cumulic Normipsamment	Entisols.
Bayard	Coarse-loamy, mixed, mesic	Entic Haplustoll	Mollisols.
Bridgeport	Fine-silty, mixed, mesic	Entic Haplustoll	Mollisols.
Colby	Fine-silty, mixed, calcareous, mesic	Typic Haplorthent	Entisols.
Duroc	Fine-silty, mixed, mesic	Cumulic Haplustoll	Mollisols.
Dwyer	Sandy, siliceous, nonacid	Typic Normipsamment	Entisols.
Glenberg	Coarse-loamy, mixed, calcareous, mesic	Cumulic Haplorthent	Entisols.
Goshen	Fine-silty, mixed, mesic	Cumulic Argiustoll	Mollisols.
Haverson	Fine-loamy, mixed, calcareous, mesic	Cumulic Haplorthent	Entisols.
Hord	Fine-silty, mixed, mesic	Cumulic Haplustoll	Mollisols.
Keith	Fine-silty, mixed, mesic	Typic Argiustoll	Mollisols.
Las	Fine-loamy, mixed, calcareous, mesic	Cumulic Haplorthent	Entisols.
McCook	Fine-loamy, mixed, mesic	Entic Haplustoll	Mollisols.
Platte	Sandy over sandy-skeletal, mesic	Psammentic Haplaquoll	Mollisols.
Scott	Fine, montmorillonitic, mesic	Typic Argialboll	Mollisols.
Ulysses	Fine-silty, mixed, mesic	Typic Haplustoll	Mollisols.
Valentine	Sandy, siliceous, nonacid, mesic	Typic Normipsamment	Entisols.

Survey since 1965. This system replaces the older system adopted in 1938 (*2*) and later revised (*4*). Readers interested in the development of the current system should refer to the latest available literature (*3*).

The current system has six categories. Beginning with the most inclusive, they are the order, the suborder, the great group, the subgroup, the family, and the series. The criteria for classification are observable or measurable properties. These properties are so chosen that soils of similar mode of origin are grouped together.

Table 7 shows the soil series classified by family, subgroup, and order. The suborder and great group are not given, because these are evident in the nomenclature of the other categories. Placement of some soil series in the current system of classification, particularly in families, may change as more precise information becomes available.

Following are brief descriptions of the categories in the current system.

Order.—Ten soil orders are recognized. They are the Entisols, Vertisols, Inceptisols, Aridisols, Mollisols, Spodosols, Alfisols, Utisols, Oxisols, and Histosols. The properties that differentiate the orders are those that give broad climatic groupings of soils. The two exceptions are the Entisols and Histosols, which occur in many different climates. Only the Entisols and Mollisols are represented in Hitchcock County.

Entisols are young. These soils have not yet developed natural genetic horizons. They consist of very recent alluvium or of quartz sand, or they are on very steep slopes.

Mollisols formed under grass. They have a soft, dark-colored surface layer and are high in bases. Rainfall has caused some leaching of carbonates and clay.

Suborder.—Orders are divided into suborders, primarily on the basis of genetic similarity. The soil properties are mainly those that reflect the presence or absence of waterlogging or differences in climate or vegetation. The climatic range is narrower than that of the orders.

Great group.—Suborders are divided into great groups on the basis of uniformity in the kinds and sequence of major soil horizons and features. The horizons are those in which clay, iron, or humus has accumulated or those that have pans that interfere with growth of roots or movement of water. The major soil features are soil temperature, the self-mulching properties of clays, and major differences in chemical composition, mainly calcium, magnesium, sodium, and potassium.

Subgroup.—Great groups are divided into subgroups, one representing the central, or typic, segment of the group, and others, called intergrades, that have properties of the group and also one or more properties of another great group, suborder, or order. Subgroups are also made in instances where soil properties intergrade outside of the range of any other great group, suborder, or order.

Family.—Subgroups are divided into families, primarily on the basis of properties that affect the growth of plants or the behavior of soils used for engineering. Among the properties considered are texture, mineralogy, reaction, permeability, consistence, thickness of horizons, and soil temperature.

Series.—Classification of soils at the series level is explained in the section "How This Survey Was Made."

Laboratory Data

Samples of Anselmo, Bridgeport, Goshen, Hord, Keith, Ulysses, and Valentine soils have been analyzed in Soil Survey laboratories. The data have been published in "Soil Survey Investigations Report No. 5" (*8*) and in "Soil Survey of Dundy County, Nebraska" (*7*). Most of the samples were obtained from locations outside Hitchcock County, but the data are considered characteristic of these soils as they occur in Hitchcock County.

General Nature of the County

Hitchcock County was organized in 1873. The area had been used as range since about 1869. The first homesteaders had moved in and started farming in 1872. A drought in 1874 forced many homesteaders to leave, and farmland reverted to range. A railroad across the county was com-

pleted in 1881, and shortly after that a second wave of homesteaders began to settle in the county. By 1910, the population was 5,415. It continued to increase until the early 1930's but has since declined. In 1960, the population was 4,826, and 43 percent of this was rural.

Hitchcock County has good transportation. A main line of a major railroad extends east and west across the central part, following the Republican River Valley, and a branch line of this railroad from Culbertson to Palisade follows the Frenchman River Valley. Two Federal highways parallel the railroads. In addition there are State and county highways throughout the county. A municipal airport at Trenton has been approved to handle commercial aircraft.

There are five grain elevators within the county, all readily accessible by truck and rail.

There are no livestock markets within the county, although there are local markets nearby. Most of the fat cattle are shipped to Denver, Omaha, and St. Joseph.

Oil is the only mineral resource that has been developed in Hitchcock County. Production was at a peak in 1961 but has since declined and leveled off, and exploration has been limited.

Ground Water

The upland region of Hitchcock County has an adequate supply of water for domestic use and for livestock but only a limited supply for pump irrigation. Deposits of sand and gravel over the Ogallala Formation are not dependable sources of water. The Ogallala Formation is relatively permeable; it has sand and gravel in the lower part. Most of the water that could be used for irrigation is obtained from this formation. Pierre Shale, which underlies the Ogallala Formation, is nearly impervious and yields water to wells only where it is jointed or fractured. Water from this formation generally contains large amounts of sodium and potassium salts and sulfates. Because of the excessive depth and the possibility of finding water of poor quality, further search for water in the Pierre Shale is not practical.

The bottom-land region has a good supply of ground water for pump irrigation. Under the valleys of the Republican River and the Frenchman River, there are deposits of water-bearing sand and gravel. Also, conditions are favorable for infiltration of precipitation and for direct recharge from streamflow. The bottom land along Driftwood Creek is similar hydrologically to that of the Republican River, but much smaller.

There are many springs along the sides of the Republican River valley and along some of the major drainageways. These springs develop as a result of natural leakage from the Ogallala Formation. Very few of them have been developed for domestic use.

Geologic Formations

Silt loam loess, dune sand, and sand and gravel cover the bedrock underlying the county. The loess and dune sand were deposited by wind; the coarse sand and gravel were deposited by streams. These materials were laid down in late geologic time (Pleistocene epoch). Since then, however, erosion has eaten through the mantle and has exposed parts of the bedrock. The Ogallala Formation and Pierre Shale are the two exposed bedrock formations.

The Ogallala Formation, which is the one nearer the surface, is part of the Tertiary system. It is made up of limy sandstone and siltstone and is locally called "magnesia rock" because of its content of magnesium. Outcrops can be found in the valley of the Republican River and in those of its tributaries.

Pierre Shale, part of the Cretaceous system, is just beneath the Ogallala Formation and underlies the entire county. This shale is dark gray to black. Exposures of it occur on the north bluffs of the Republican River valley about 1 mile west of Trenton, and also at the base of Trenton Dam on the Republican River.

Other older Cretaceous rocks which occur in this area but are not exposed are, in order of depth, the Niobrara Formation, Carlile Shale, Greenhorn Limestone, Graneros Shale, Dakota Sandstone, Fuson Shale, and Lakota Sandstone.

Climate [6]

The climate of Hitchcock County is one of limited precipitation, low humidity, frequent wind shifts, and frequent sharp changes in temperature. Table 8 gives temperature and precipitation data for the county, and table 9 gives the probable dates of specified low temperatures in spring and fall.

Proximity to the Rocky Mountains, which form a high, unbroken barrier to the west, has had a marked effect on climate in the county. Except on the west, the area is fully exposed. High elevation and great distance to a large body of water are also important influences. The variation in elevation within the county is about 500 feet. The low point of 2,535 feet is in the east-central part of the county, and the high point of 3,000 feet is in the northwestern uplands. As a result of this upward slope to the west, prolonged easterly winds encourage low clouds, fog, and damp weather, and downslope winds from the west bring low humidity and clear skies.

Air from the west loses most of its moisture in crossing the mountains. Consequently, most of the precipitation comes from the Gulf of Mexico and the Caribbean. Hitchcock County is near the western edge of the moisture-laden southerly winds. An eastward shift of these winds can result in a big decrease in rainfall, and a slight westward movement has the opposite effect. Consequently, there is considerable variation in annual precipitation. The average precipitation of the 10 wettest years during the period 1888–1965 is more than twice that of the 10 driest, and the precipitation in the wettest year (37.99 inches in 1915) is nearly six times that of the driest year (6.81 inches in 1894). In recent years 1965 has been the wettest year, with 28.48 inches of precipitation, and 1956 has been the driest year, with 11.28 inches of precipitation.

Because of the limited amount of precipitation, the distribution of it is important. Normally more than three-fourths of the annual precipitation falls during the growing season, April through September, but there

[6] Prepared by RICHARD E. MYERS, State climatologist, U.S. Weather Bureau.

TABLE 8.—*Temperature and precipitation*

[All data at Culbertson; probabilities of precipitation based on period 1888–1962; all other data based on period 1934–63]

Month	Temperature: Average daily maximum	Temperature: Average daily minimum	Temperature: Two years in 10 will have at least 4 days with— Maximum temperature equal to or higher than—	Temperature: Two years in 10 will have at least 4 days with— Minimum temperature equal to or lower than—	Precipitation: Average total	Precipitation: One year in 10 will have— Equal to or less than	Precipitation: One year in 10 will have— Equal to or more than—	Precipitation: Days with 1 inch or more snow cover	Precipitation: Average depth of snow on days with snow cover
	°F.	°F.	°F.	°F.	In.	In.	In.		In.
January	40. 9	12. 5	60	−8	0. 45	0. 02	0. 91	10	3. 0
February	45. 4	16. 9	66	0	. 57	. 10	1. 44	6	2. 6
March	53. 2	24. 2	76	8	1. 21	. 16	2. 47	5	5. 1
April	65. 5	36. 0	84	23	1. 86	. 37	4. 38	1	2. 9
May	75. 3	47. 5	91	35	3. 42	. 91	5. 53	0	0
June	85. 7	57. 5	102	46	3. 22	1. 20	6. 11	0	0
July	93. 0	63. 2	105	55	2. 84	. 81	5. 63	0	0
August	91. 4	61. 5	104	52	2. 42	. 78	4. 63	0	0
September	82. 4	50. 1	99	36	1. 65	. 13	3. 59	0	0
October	70. 8	37. 3	88	25	1. 00	. 13	2. 52	(1)	1. 0
November	53. 5	23. 0	71	9	. 66	. 02	1. 65	3	3. 1
December	43. 9	16. 7	63	1	. 51	. 05	1. 42	9	3. 5
Year	66. 8	37. 2	[2] 107	[3] −16	19. 81	13. 73	27. 66	34	3. 4

[1] Less than 0.5 day.
[2] Average annual highest maximum.
[3] Average annual lowest minimum.

are frequent variations within the season. Droughty spells are not uncommon.

Winter precipitation is light and generally falls as snow, but most winters have at least one spell of freezing rain. Winter snows are light and dry. They often accompany strong northerly winds. The snow drifts considerably, and ordinarily only a part of the ground is covered. The snowstorms are interspersed with warm periods, which melt the snow within a few days. March has the largest snowfall of any month, but the snow at this time is wet and sticky and less likely to drift.

The character of the precipitation changes as spring advances. March snows are sometimes replaced by slow, steady, drizzling rain from dense clouds carried on easterly or southerly winds. Precipitation varies less during this season and gradually increases until it reaches a peak in May. During May the steady type of precipitation gives way to showers and thunderstorms. Frequently these storms are severe. Hailstorms strike some parts of the county during late spring or early summer nearly every year. Winter wheat has grown enough by this time to be permanently damaged by the hail, and frequently a considerable acreage is destroyed. Strong winds accompany the more severe thunderstorms. Frequently these winds blow soil, and occasionally they cause duststorms. Sometimes trees and buildings are damaged. Tornadoes are less frequent than farther to the east.

As the summer advances, the amount of precipitation decreases and nearly all of it comes as showers. The pattern and amount of rainfall favor wheat over corn,

TABLE 9. *Probabilities of specified temperatures in spring and fall*

[All data at Culbertson]

Probability	Dates for given probability and temperature: 16° F.	20° F.	24° F.	28° F.	32° F.
Spring:					
1 year in 10 later than	April 8	April 19	April 28	May 11	May 22
2 years in 10 later than	April 3	April 13	April 23	May 5	May 16
5 years in 10 later than	March 23	April 3	April 12	April 25	May 6
Fall:					
1 year in 10 earlier than	October 23	October 19	October 12	September 28	September 18
2 years in 10 earlier than	October 29	October 24	October 17	October 3	September 23
5 years in 10 earlier than	November 9	November 3	October 27	October 14	October 3

and there is nearly three times as much acreage in wheat. The droughty hot spells of summer inflict lasting damage on corn, especially if they occur during the tasseling and silking stage. Grain sorghum recovers from a dry spell better than corn; consequently, the acreage of this crop has increased.

Precipitation continues to decrease during the fall, and there are bright warm days and crisp nights.

The elevation and the frequently low humidity combine to cause a wide range in temperature between day and night. The average difference between day and night temperatures at Culbertson is 29.6° F. The difference is greatest, nearly 34°, in October. A temperature above 100° is not uncommon from June through August, and a temperature below zero occurs regularly during the winter. During the period 1903–1965, a temperature below zero was recorded at Culbertson in every month from November through April, and a temperature above 100° was recorded in each month from April through September. April has had temperatures above 100° and below zero; October has had neither.

Table 9 shows that the average date of the last 32° temperature in spring is May 6 and the average date of the first one in fall is October 3. Thus, the length of the growing season averages 150 days. A hard freeze of 16° can be expected before October 23 in 1 year in 10. Dates and probabilities of other below-freezing temperatures are also shown.

The potential monthly amounts of evapotranspiration, as computed by the Thornthwaite method using mean temperatures from Culbertson for the period 1934–1963, are given in the list that follows. No figures are shown for December through February when the mean temperatures are below 32° F.

Month	*Inches*	*Month*	*Inches*
March	0.44	August	5.76
April	1.67	September	3.64
May	3.54	October	1.95
June	5.23	November	.30
July	6.78		

Evaporation was measured at Trenton Dam during the period 1954–1965. The monthly averages are given in the list that follows. No measurements were taken in the winter months.

Month	*Inches*	*Month*	*Inches*
April	7.79	August	12.03
May	9.28	September	8.85
June	11.18	October	5.95
July	12.91		

Agriculture

Hitchcock County once was nearly all rangeland. As the population increased, more land was broken for cultivation. At the time of the 1964 Census of Agriculture, 434,852 acres, or about 95 percent of the land area, was farmland. There were about 122,780 acres of cropland, 200,000 acres of range, 744 acres of woodland, and 11,173 acres of miscellaneous land.

Growing wheat, corn, and milo as cash crops and raising livestock, mostly cattle, are the main agricultural enterprises. The 1964 Census of Agriculture shows the following acreages of crops:

	Acres
Corn, irrigated	12,581
Corn, dryland	4,717
Alfalfa, irrigated	3,049
Alfalfa, dryland	1,747
Sorghum, irrigated	1,836
Sorghum, dryland	28,675
Wheat	62,407
Land in cultivated summer fallow	88,054

In 1964 there were 561 farms in the county, and the average size was about 775 acres.

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Glossary

Alkali soil. Generally, a highly alkaline soil. Specifically, a soil that has so high a degree of alkalinity (pH 8.5 or higher) or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that the growth of most crop plants is reduced.

Alluvium. Soil material, such as sand, silt, or clay, that has been deposited on land by streams.

Bearing capacity. The capacity of a soil to support loads.

Blowout. An excavation produced by wind action in loose soil, usually sand.

Calcareous soil. A soil containing enough calcium carbonate (often with magnesium carbonate) to effervesce (fizz) visibly when treated with cold, dilute hydrochloric acid.

Caliche. A more or less cemented deposit of calcium carbonate in many soils of warm-temperate areas, like the Southwestern States. It may consist of soft, thin layers in the soil or of hard, thick beds just beneath the solum, or it may be exposed at the surface by erosion.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Colluvium. Soil material, rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.

Concretions. Hard grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrations of compounds that cement the soil grains together. The composition of some concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are examples of material commonly found in concretions.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent; soil will not hold together in a mass.

Friable.—When moist, soil crushes easily under gentle to moderate pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, soil crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, soil is readily deformed by moderate pressure but can be pressed into a lump; will form a wire when rolled between thumb and forefinger.

Sticky.—When wet, soil adheres to other material; tends to stretch somewhat and pull apart, rather than to pull free from other material.

Hard.—When dry, soil is moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, soil breaks into powder or individual grains under very slight pressure.

Cemented.—Soil is hard and brittle; little affected by moistening.

Dispersion, soil. Deflocculation of a soil and suspension of the particles in water.

Diversion. A ridge of earth, generally a terrace, that diverts runoff from its natural course and thus protects areas downslope from the effects of such runoff.

Horizon, soil. A layer of soil, approximately parallel to the surface, that has distinct characteristics produced by soil-forming processes. These are the major horizons:

O horizon.—The layer of organic matter on the surface of a mineral soil. This layer consists of decaying plant residues.

A horizon.—The mineral horizon at the surface or just below an O horizon. This horizon is the one in which living organisms are most active and therefore is marked by the accumulation of humus. The horizon may have lost one or more of the following: soluble salts, clay, or sesquioxides (iron and aluminum oxides).

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of change from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics caused by (1) accumulation of clay, sesquioxides, humus, or some combination of these; (2) prismatic or blocky structure; (3) redder or stronger colors than the A horizon; or (4) some combination of these. The A and B horizons together are usually called the solum, or true soil. If a soil lacks a B horizon, the A horizon is the solum.

C horizon.—The weathered rock material immediately beneath the solum. In most soils this material is presumed to be like that from which the overlying horizons were formed. If the material is known to be different from that in the solum, a Roman numeral precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock usually underlies a C horizon but may be immediately beneath an A or B horizon.

Permeability, soil. The quality that enables a soil horizon to transmit water or air. Terms used to describe permeability are as follows: *Very slow, slow, moderately slow, moderate, moderately rapid, rapid,* and *very rapid.*

Piping. Subsurface erosion, resulting in tunneling and caving.

Phase, soil. A subdivision of a soil type, series, or other unit in the soil classification system, made because of differences that affect management but do not affect classification. A soil type, for example, may be divided into phases because of differences in slope, stoniness, thickness, or some other characteristic that affects management.

Profile, soil. A vertical section of the soil through all its horizons and extending into the parent material. See Horizon, soil.

Reaction, soil. The degree of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is precisely neutral in reaction, because it is neither acid or alkaline. In words, the degrees of acidity or alkalinity are expressed thus:

	pH		*pH*
Extremely acid	Below 4.5	Mildly alkaline	7.4 to 7.8
Very strongly acid	4.5 to 5.0	Moderately alkaline.	7.9 to 8.4
Strongly acid	5.1 to 5.5	Strongly alkaline	8.5 to 9.0
Medium acid	5.6 to 6.0	Very strongly alkaline.	9.1 and higher
Slightly acid	6.1 to 6.5		
Neutral	6.6 to 7.3		

Saline-alkali soil. A soil that contains a harmful concentration of salts and exchangeable sodium; or contains harmful salts and has a highly alkaline reaction; or contains harmful salts and exchangeable sodium and is strongly alkaline in reaction.

Saline soil. A soil that contains soluble salts in amounts that impair growth of plants but that does not contain excess exchangeable sodium.

Sand. As a soil separate, individual rock or mineral fragments 0.05 to 2.0 millimeters in diameter. Most sand grains consist of quartz, but sand may be of any mineral composition. As a textural class, soil that is 85 percent or more sand and not more than 10 percent clay.

Series, soil. A group of soils developed from a particular type of parent material and having genetic horizons that, except for texture of the surface layer, are similar in differentiating characteristics and in arrangement in the profile.

Shear strength. The ability of a soil to resist shearing or sliding along internal surfaces within a mass.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand 0.05 millimeter). As a textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Slope, soil. The incline of the surface of the soil area. It is an integral part of the soil, not something apart from it.

Soil. A natural, three-dimensional body on the earth's surface that supports plants and that has properties resulting from the integrated effect of climate and living matter acting upon parent material, as conditioned by relief over periods of time.

Solum. The upper part of a soil profile, above the parent material, in which the processes of soil formation are active. The solum in a mature soil includes the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying parent material. The living roots and other plant and animal life characteristic of the soil are largely confined to the solum.

Stripcropping. Growing crops in a systematic arrangement of strips, or bands, to serve as vegetative barriers to wind and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or clusters that are separated from adjoining aggregates and have properties unlike those of an equal mass of unaggregated primary soil particles. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular. Structureless* soils are (1) *single grain* (each grain by itself, as in dune sand) or (2) *massive* (the particles adhering without any regular cleavage, as in many claypans and hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the profile below plow depth.

Substratum. Any layer lying beneath the solum, or true soil; the C or R horizon.

Terrace, level. An earthen embankment or a ridge and channel, for control of water erosion. It is constructed across the slope at suitable intervals and has no grade. Water is detained in the channel and allowed to infiltrate.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. (See also clay, sand, and silt.) The basic textural classes, in order of increasing proportion of fine particles, are as follows: *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay.* The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Tilth, soil. The condition of the soil in relation to the growth of plants, especially soil structure. Good tilth refers to the friable state and is associated with high noncapillary porosity and stable, granular structure. A soil in poor tilth is nonfriable, hard, nonaggregated, and difficult to till.

Type, soil. A subdivision of the soil series that is made on the basis of differences in the texture of the surface layer.

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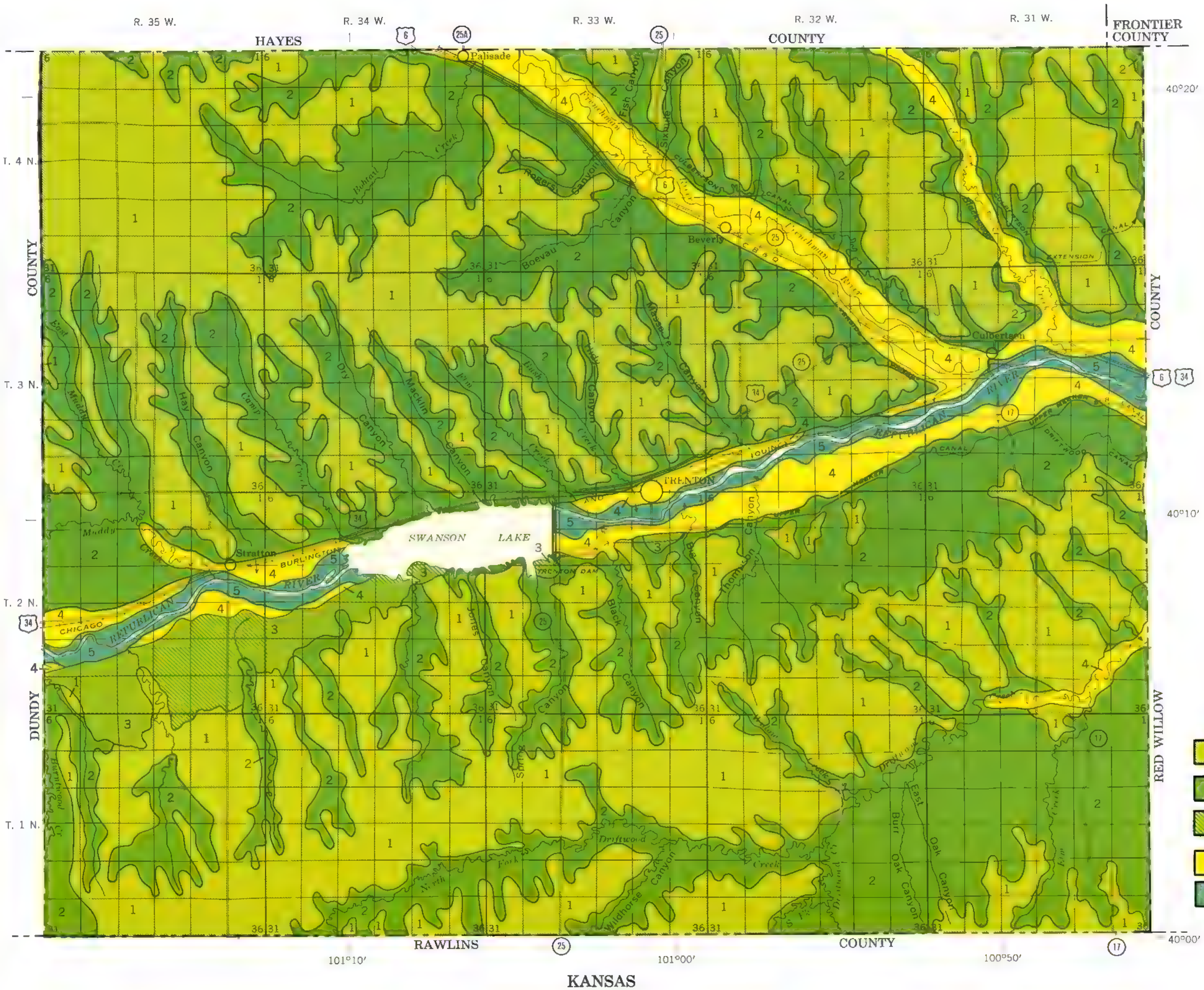


U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

UNIVERSITY OF NEBRASKA
CONSERVATION AND SURVEY DIVISION

GENERAL SOIL MAP
HITCHCOCK COUNTY, NEBRASKA

SCALE IN MILES

1 0 1 2 3 4

SOIL ASSOCIATIONS

1 Keith–Goshen association: Silty soils on tablelands

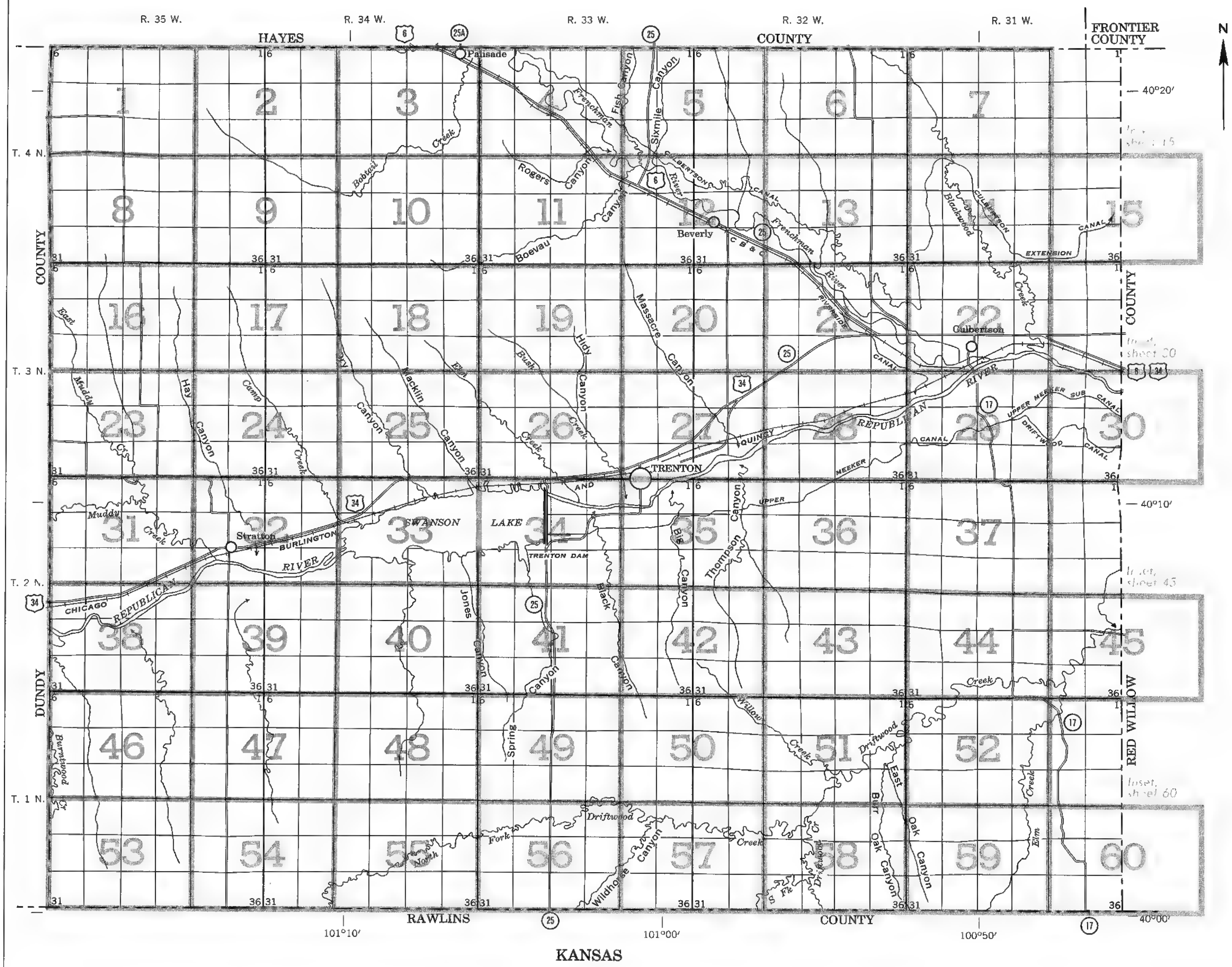
2 Colby association: Silty soils on canyon walls and hills

3 Valentine–Anselmo association: Sandy soils on uplands

4 Bridgeport–McCook–Duroc association: Loamy soils on foot slopes, terraces, and high bottom lands

5 Sandy alluvial land–Haverson–Las association: Sandy and loamy soils on river flood plains

September 1968



INDEX TO MAP SHEETS
HITCHCOCK COUNTY, NEBRASKA

SCALE IN MILES

1 0 1 2 3 4

CONVENTIONAL SIGNS

WORKS AND STRUCTURES

Highways and roads
- Dual
- Good motor
- Poor motor
- Trail

Highway markers
- National Interstate
- U. S.
- State or county

Railroads
- Single track
- Multiple track
- Abandoned

Bridges and crossings
- Road
- Trail, foot
- Railroad
- Ferry — FY
- Ford — FORD
- Grade
- R. R. over
- R. R. under
- Tunnel

Buildings
- School
- Church

Windmill

Mines and Quarries

Mine dump

Pits, gravel or other

Power line

Pipeline

Cemetery

Dams

Levee

Tanks

Well, oil or gas

BOUNDARIES

- National or state
- County
- Reservation
- Land grant
- Small park, cemetery, airport
- Land survey division corners

DRAINAGE

Streams, double-line
- Perennial
- Intermittent

Streams, single-line
- Perennial
- Intermittent
  - Crossable with tillage implements
  - Not crossable with tillage implements
  - Unclassified

Canals and ditches — CANAL

Siphon — SIPHON

Lakes and ponds
- Perennial — water, w
- Intermittent

Well, irrigation

Spring

Marsh or swamp

Wet spot

Alluvial fan

Drainage end

RELIEF

Escarpments
- Bedrock
- Other

Prominent peak

Depressions, unclassified — Large, Small

SOIL SURVEY DATA

- Soil boundary and symbol — Dx
- Gravel
- Stony, very stony
- Rock outcrops
- Chert fragments
- Clay spot
- Sand spot
- Gumbo or scabby spot
- Made land
- Severely eroded spot
- Blowout, wind erosion
- Gully
- Short steep slope

SOIL LEGEND

Each soil symbol consists of letters, or of letters and numbers; for example, KeAW, KeB2, Mb, or 2Mb. If slope forms part of the soil name, the last capital letter, A, B, C, or D, in a symbol shows the slope class. A final number, 2, in a symbol shows that the soil is eroded. A final capital letter, W, indicates evidence of erosion that has not modified the soil enough to be estimated with reliability.

SYMBOL	NAME
An	Anselmo fine sandy loam, 0 to 1 percent slopes
AnA	Anselmo fine sandy loam, 1 to 3 percent slopes
AnB	Anselmo fine sandy loam, 3 to 5 percent slopes
AnC	Anselmo fine sandy loam, 5 to 9 percent slopes
AoAW	Anselmo loamy fine sand, 0 to 3 percent slopes
AoBW	Anselmo loamy fine sand, 3 to 7 percent slopes
BcA	Bankard loamy fine sand
BCa	Rough broken land, caliche
Bf	Bayard fine sandy loam, 0 to 1 percent slopes
BfA	Bayard fine sandy loam, 1 to 3 percent slopes
BfA2	Bayard loamy fine sand, hummocky
BL	Rough broken land, loess
Br	Bridgeport silt loam, 0 to 1 percent slopes
BrA	Bridgeport silt loam, 1 to 3 percent slopes
BrB	Bridgeport silt loam, 3 to 7 percent slopes
Bw	Bayard loam, 0 to 1 percent slopes
CbCW	Colby silt loam, 7 to 9 percent slopes
CbD	Colby silt loam, 9 to 30 percent slopes
2Dc	Duroc silt loam, terrace, 0 to 1 percent slopes
2DcA	Duroc silt loam, terrace, 1 to 3 percent slopes
DVC	Dwyer–Valentine loamy fine sands, 3 to 17 percent slopes
Gd	Glenberg fine sandy loam
2Gd	Glenberg fine sandy loam, saline–alkali
Gh	Goshen silt loam, 0 to 1 percent slopes
Hd	Hord silt loam, 0 to 1 percent slopes
Hf	Haverson fine sandy loam
2HL	Haverson and Las loams, saline–alkali
KeA	Keith silt loam, 1 to 3 percent slopes
KeAW	Keith silt loam, 1 to 3 percent slopes, eroded
KeB	Keith silt loam, 3 to 7 percent slopes
KeB2	Keith silt loam, 3 to 7 percent slopes, eroded
KG	Keith and Goshen silt loams, 0 to 1 percent slopes
Mb	McCook loam
2Mb	McCook loam, overflow
4Mb	McCook loam, sand substratum variant
Pt	Platte loam
Sc	Scott silt loam
Ss	Slickspots
Sx	Sandy alluvial land
Sy	Broken alluvial land
UsB2	Ulysses silt loam, 3 to 7 percent slopes, eroded
UsC	Ulysses silt loam, 7 to 9 percent slopes
UsC2	Ulysses and Colby silt loams, 7 to 9 percent slopes, eroded
VaC	Valentine fine sand, rolling

Soil map constructed 1967 by Cartographic Division, Soil Conservation Service, USDA, from 1965 aerial photographs. Controlled mosaic based on Nebraska plane coordinate system, south zone, Lambert conformal conic projection, 1927 North American datum.

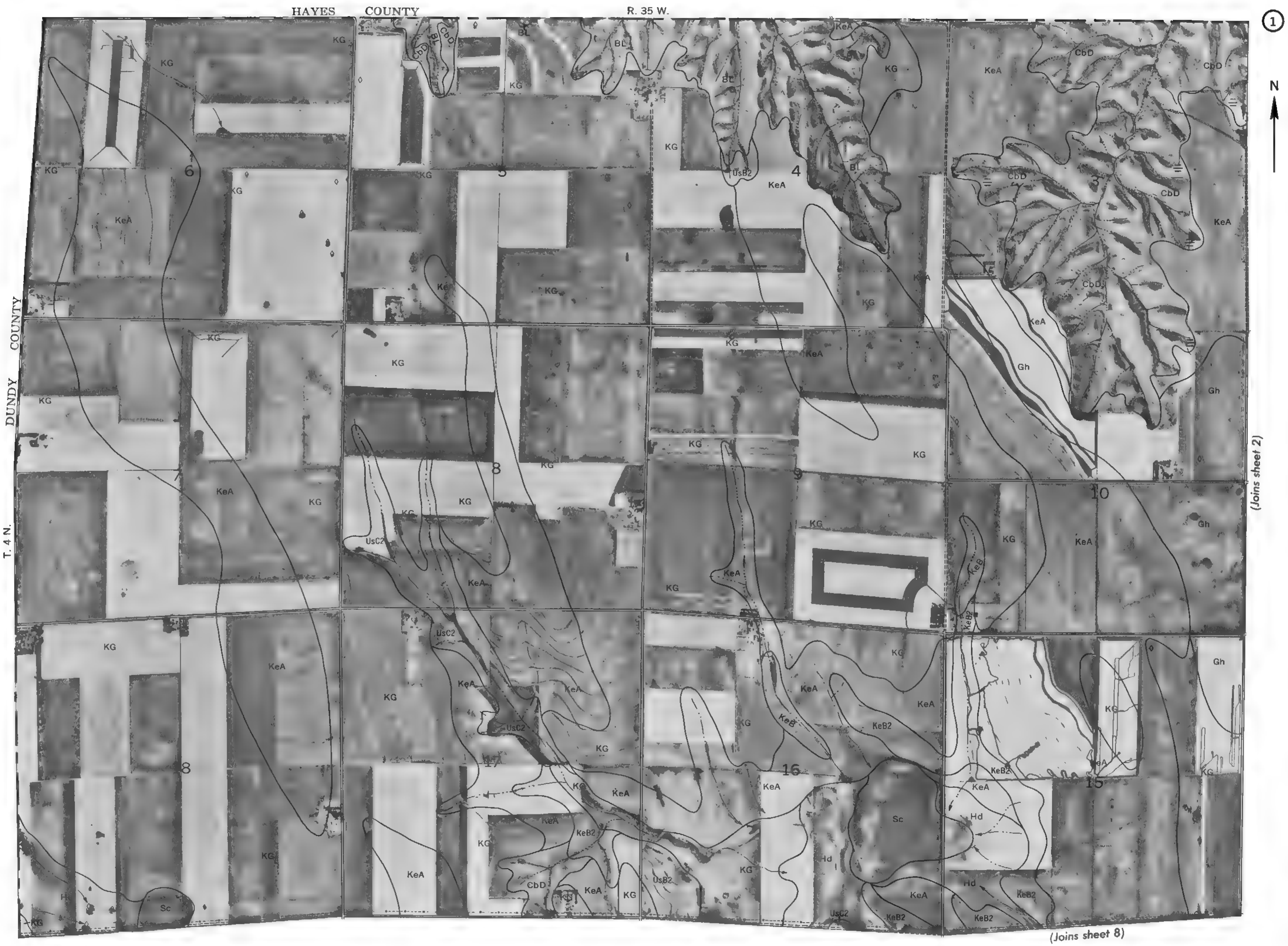
GUIDE TO MAPPING UNITS

For a full description of a mapping unit, read both the description of the mapping unit and that of the soil series to which the mapping unit belongs. In referring to a capability unit, read the introduction to the section it is in for general information about its management. For facts about wildlife and recreation, turn to the section beginning on page 30. Other information is given in tables as follows:

Acreage and extent, table 1, page 5.
Predicted yields, table 2, page 26.
Engineering uses of the soils, table 4, page 32; table 5, page 34; and table 6, page 38.

Map symbol	Mapping unit	Described on page	Capability unit Dryland Symbol	Dryland Page	Capability unit Irrigated Symbol	Irrigated Page	Range site Name	Range site Page	Windbreak group Name	Windbreak group Page
An	Anselmo fine sandy loam, 0 to 1 percent slopes	6	IIe-3	19	IIe-3	24	Sandy	28	Sandy	30
AnA	Anselmo fine sandy loam, 1 to 3 percent slopes	6	IIIe-3	21	IIe-3	24	Sandy	28	Sandy	30
AnB	Anselmo fine sandy loam, 3 to 5 percent slopes	6	IIIe-3	21	IIIe-3	25	Sandy	28	Sandy	30
AnC	Anselmo fine sandy loam, 5 to 9 percent slopes	7	IVe-3	22	IVe-3	25	Sandy	28	Sandy	30
AoAW	Anselmo loamy fine sand, 0 to 3 percent slopes	7	IIIe-5	21	IIIe-5	25	Sandy	28	Sandy	30
AoBW	Anselmo loamy fine sand, 3 to 7 percent slopes	7	IVe-5	22	IVe-5	26	Sandy	28	Sandy	30
BcA	Bankard loamy fine sand	7	IIIe-5	21	IIIe-5	25	Sandy Lowland	28	Sandy	30
BCa	Rough broken land, caliche	15	VIIs-3	24	None	--	Shallow Limy	29	None	--
Bf	Bayard fine sandy loam, 0 to 1 percent slopes	8	IIe-3	19	IIe-3	24	Sandy	28	Sandy	30
BfA	Bayard fine sandy loam, 1 to 3 percent slopes	8	IIIe-3	21	IIe-3	24	Sandy	28	Sandy	30
BfA2	Bayard loamy fine sand, hummocky	8	IIIe-5	21	IIIe-5	25	Sandy	28	Sandy	30
BL	Rough broken land, loess	16	VIIe-1	24	None	--	Thin Loess	29	Silty to Clayey	29
Br	Bridgeport silt loam, 0 to 1 percent slopes	8	IIc-1	20	I-1	24	Silty	28	Silty to Clayey	29
BrA	Bridgeport silt loam, 1 to 3 percent slopes	9	IIe-1	19	IIe-1	24	Silty	28	Silty to Clayey	29
BrB	Bridgeport silt loam, 3 to 7 percent slopes	9	IIIe-1	20	IIIe-1	25	Silty	28	Silty to Clayey	29
Bw	Bayard loam, 0 to 1 percent slopes	8	I-1	19	I-1	24	Silty	28	Silty to Clayey	29
CbCW	Colby silt loam, 7 to 9 percent slopes	9	IVe-8	22	None	--	Limy Upland	28	Silty to Clayey	29
CbD	Colby silt loam, 9 to 30 percent slopes	9	VIe-9	23	None	--	Limy Upland	28	Silty to Clayey	29
2Dc	Duroc silt loam, terrace, 0 to 1 percent slopes	10	IIc-1	20	I-1	24	Silty	28	Silty to Clayey	29
2DcA	Duroc silt loam, terrace, 1 to 3 percent slopes	10	IIe-1	19	IIe-1	24	Silty	28	Silty to Clayey	29
DVC	Dwyer-Valentine loamy fine sands, 3 to 17 percent slopes	10	VIe-5	23	None	--	Sands	28	Very Sandy	30
Gd	Glenberg fine sandy loam	11	IIe-3	19	IIe-3	24	Sandy Lowland	28	Sandy	30
2Gd	Glenberg fine sandy loam, saline-alkali	11	IVs-1	23	IIIs-1	25	Saline Lowland	28	Moderately Saline or Alkali	30
Gh	Goshen silt loam, 0 to 1 percent slopes	12	IIc-1	20	I-1	24	Silty	28	Silty to Clayey	29
Hd	Hord silt loam, 0 to 1 percent slopes	13	IIc-1	20	I-1	24	Silty	28	Silty to Clayey	29
Hf	Haverson fine sandy loam	12	IIe-3	19	IIe-3	24	Sandy Lowland	28	Sandy	30
2HL	Haverson and Las loams, saline-alkali	12	IVs-1	23	IIIs-1	25	Saline Lowland	28	Moderately Saline or Alkali	30
KeA	Keith silt loam, 1 to 3 percent slopes	13	IIe-1	19	IIe-1	24	Silty	28	Silty to Clayey	29
KeAW	Keith silt loam, 1 to 3 percent slopes, eroded	13	IIe-1	19	IIe-1	24	Silty	28	Silty to Clayey	29
KeB	Keith silt loam, 3 to 7 percent slopes	14	IIIe-1	20	IIIe-1	25	Silty	28	Silty to Clayey	29
KeB2	Keith silt loam, 3 to 7 percent slopes, eroded	14	IIIe-1	20	IIIe-1	25	Silty	28	Silty to Clayey	29
KG	Keith and Goshen silt loams, 0 to 1 percent slopes	14	IIc-1	20	I-1	24	Silty	28	Silty to Clayey	29
Mb	McCook loam	15	I-1	19	I-1	24	Silty Lowland	28	Silty to Clayey	29
2Mb	McCook loam, overflow	15	IIw-3	19	IIw-3	24	Silty Overflow	27	Moderately Wet	30
4Mb	McCook loam, sand substratum variant	15	IIs-5	20	IIs-5	25	Silty Lowland	28	Silty to Clayey	29
Pt	Platte loam	15	Vw-1	23	None	--	Subirrigated	27	Wet	30
Sc	Scott silt loam	16	VIw-2	24	None	--	Silty Overflow	27	Wet	30
Ss	Slickspots	16	VIs-1	24	IVs-1	26	Saline Lowland	28	None	--
Sx	Sandy alluvial land	16	VIw-5	24	None	--	Sandy Lowland	28	Moderately Wet	30
Sy	Broken alluvial land	9	VIw-1	23	None	--	Silty Overflow	27	Moderately Wet	30
UsB2	Ulysses silt loam, 3 to 7 percent slopes, eroded	17	IIIe-1	20	IIIe-1	25	Limy Upland	28	Silty to Clayey	29
UsC	Ulysses silt loam, 7 to 9 percent slopes	17	IVe-1	21	IVe-1	25	Silty	28	Silty to Clayey	29
UsC2	Ulysses and Colby silt loams, 7 to 9 percent slopes, eroded	17	IVe-1	21	IVe-1	25	Limy Upland	28	Silty to Clayey	29
VaC	Valentine fine sand, rolling	18	VIe-5	23	None	--	Sands	28	Very Sandy	30

HITCHCOCK COUNTY, NEBRASKA — SHEET NUMBER 1



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HITCHCOCK COUNTY, NEBRASKA NO. 1

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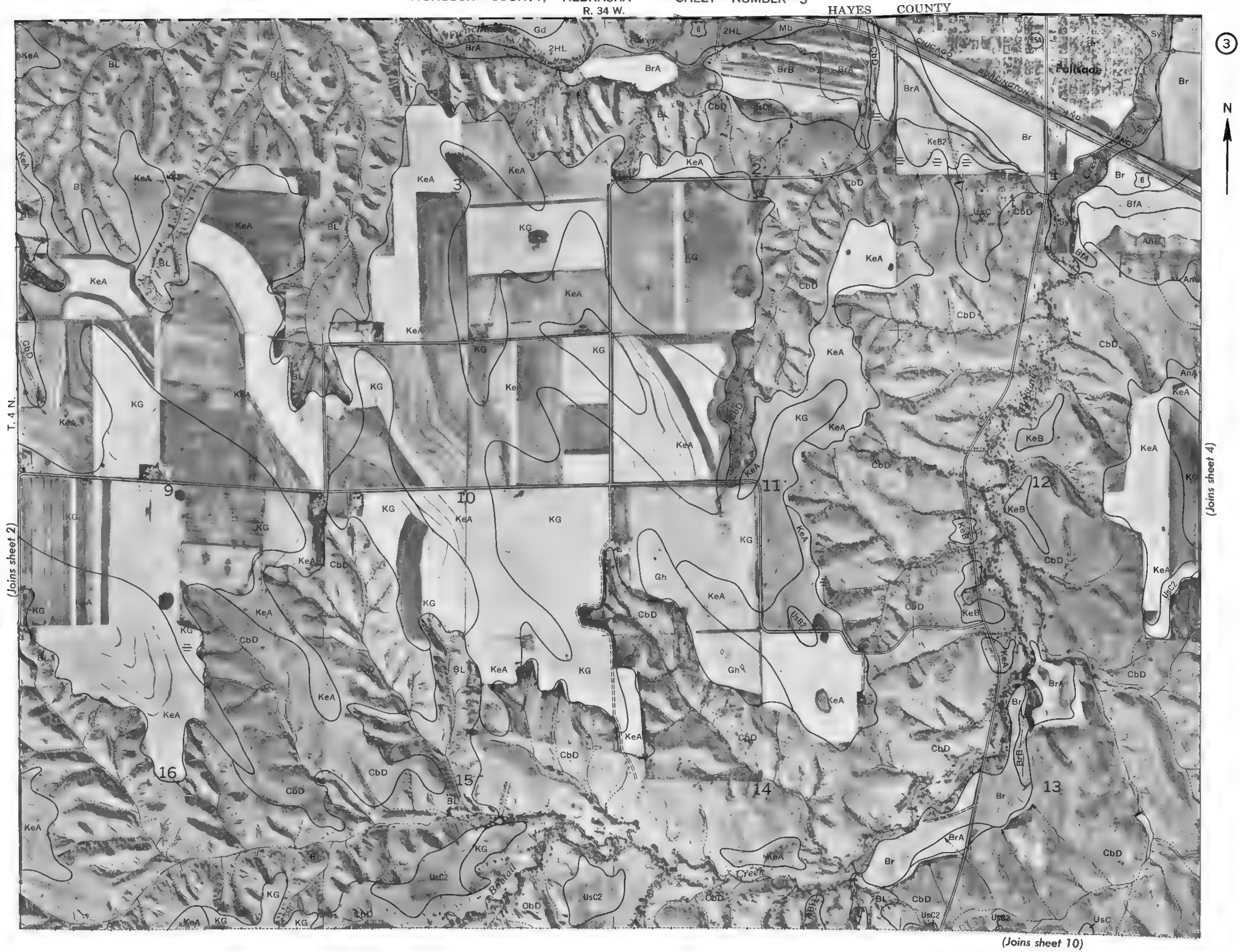

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HITCHCOCK COUNTY, NEBRASKA NO. 3

HITCHCOCK COUNTY, NEBRASKA — SHEET NUMBER 4

(4)

HAYES COUNTY

R. 33 W.

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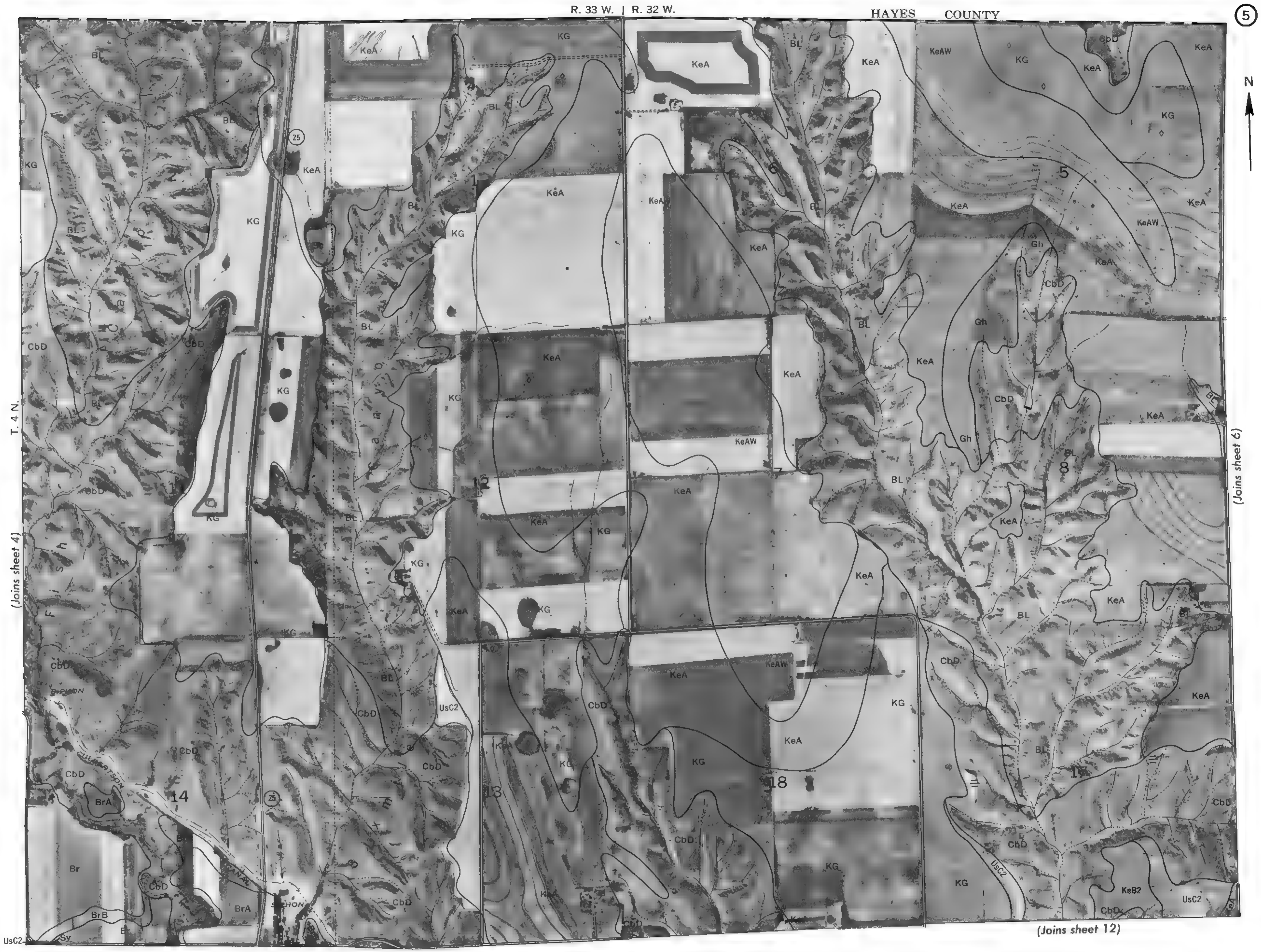

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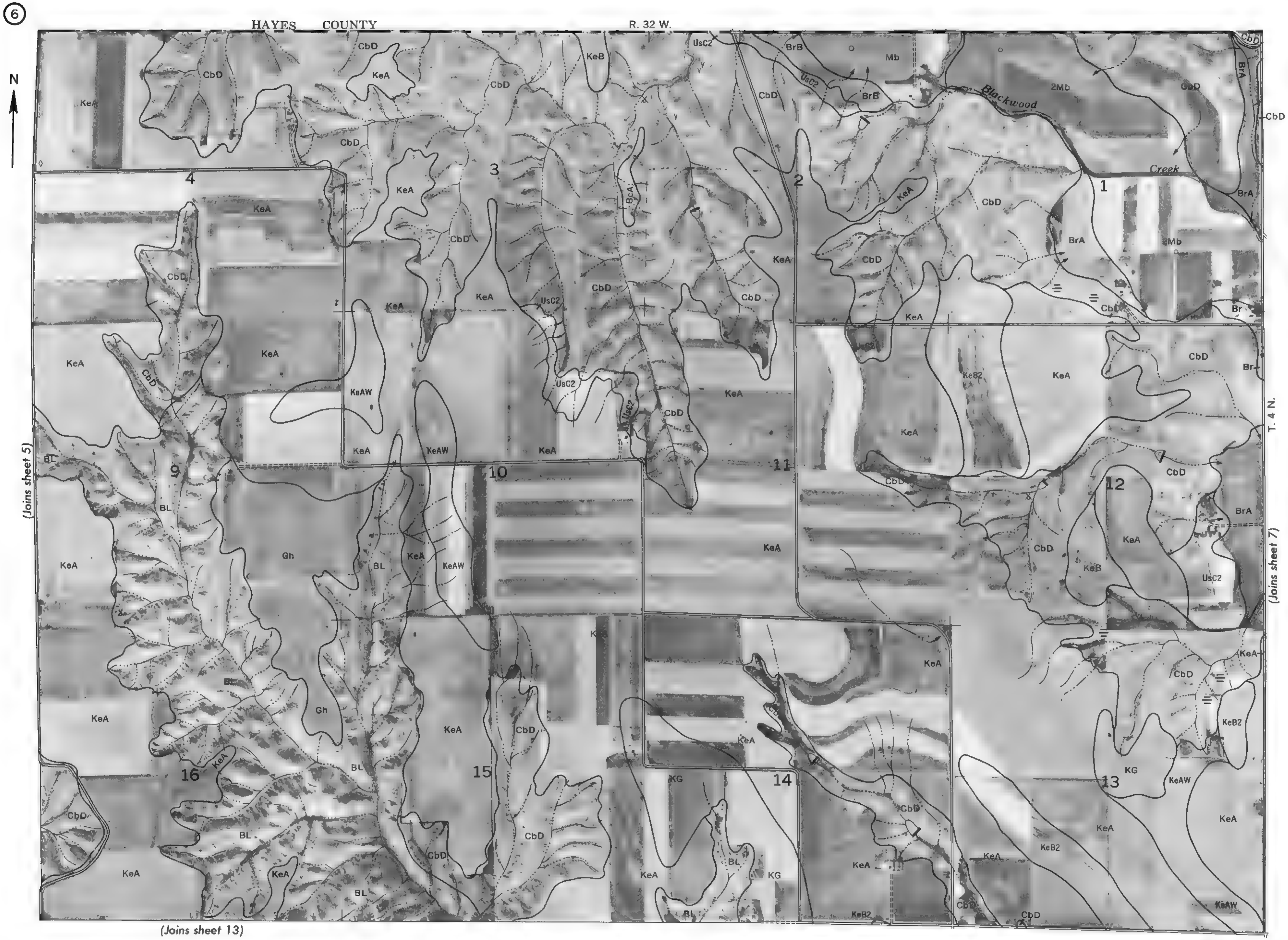
HITCHCOCK COUNTY, NEBRASKA NO. 5



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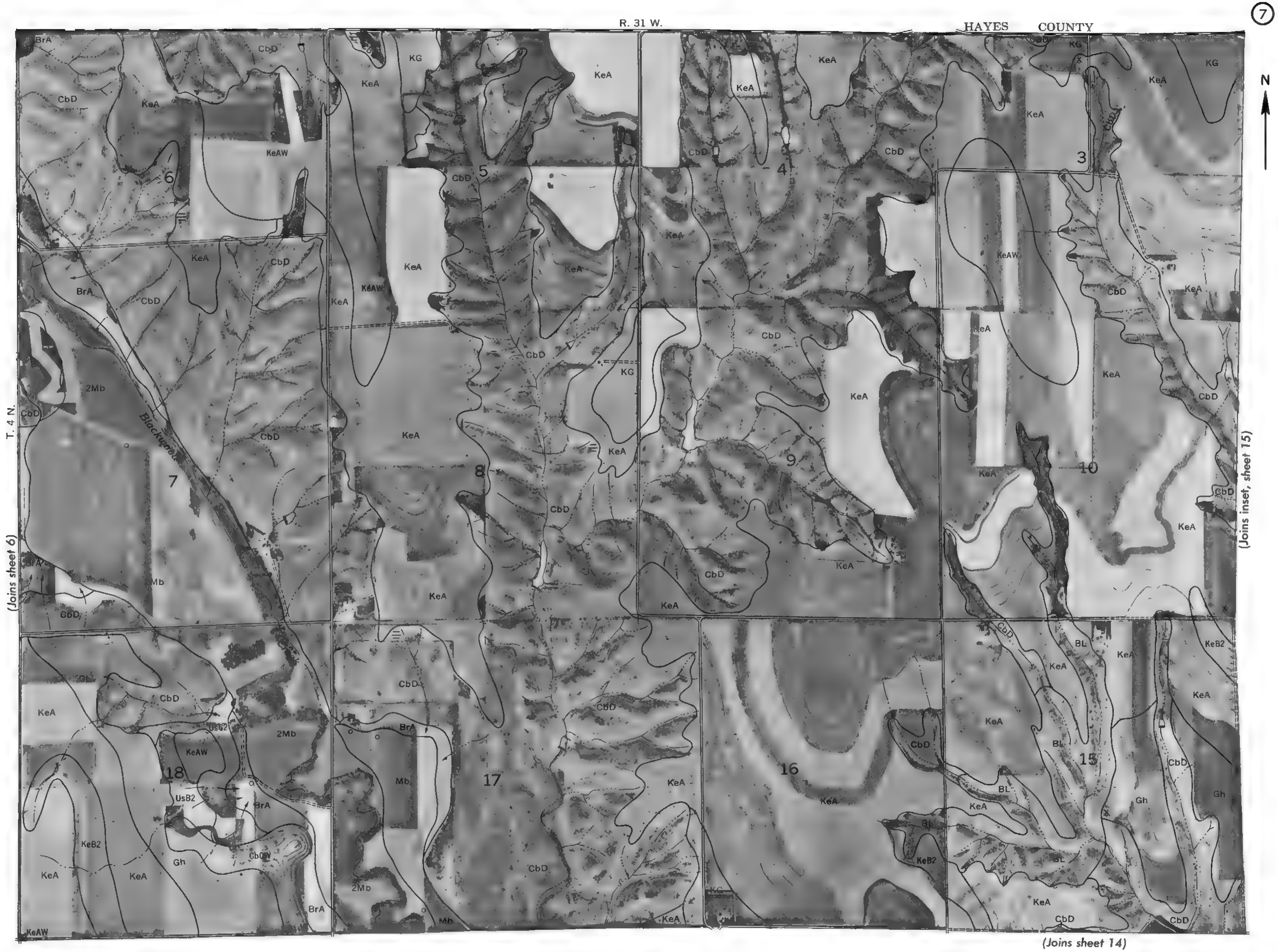

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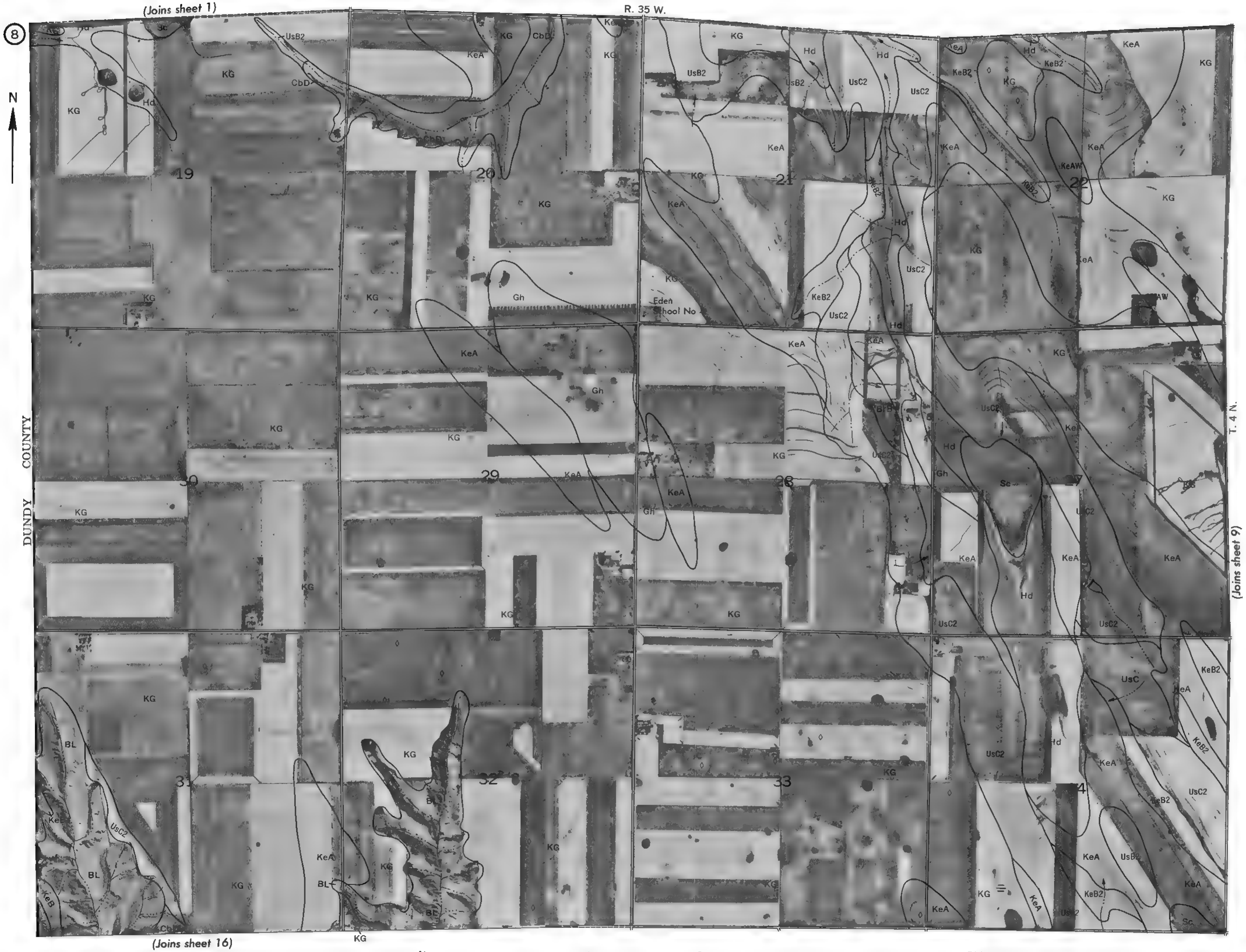
HITCHCOCK COUNTY, NEBRASKA NO. 7

HITCHCOCK COUNTY, NEBRASKA — SHEET NUMBER 8



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HITCHCOCK COUNTY, NEBRASKA NO. 8

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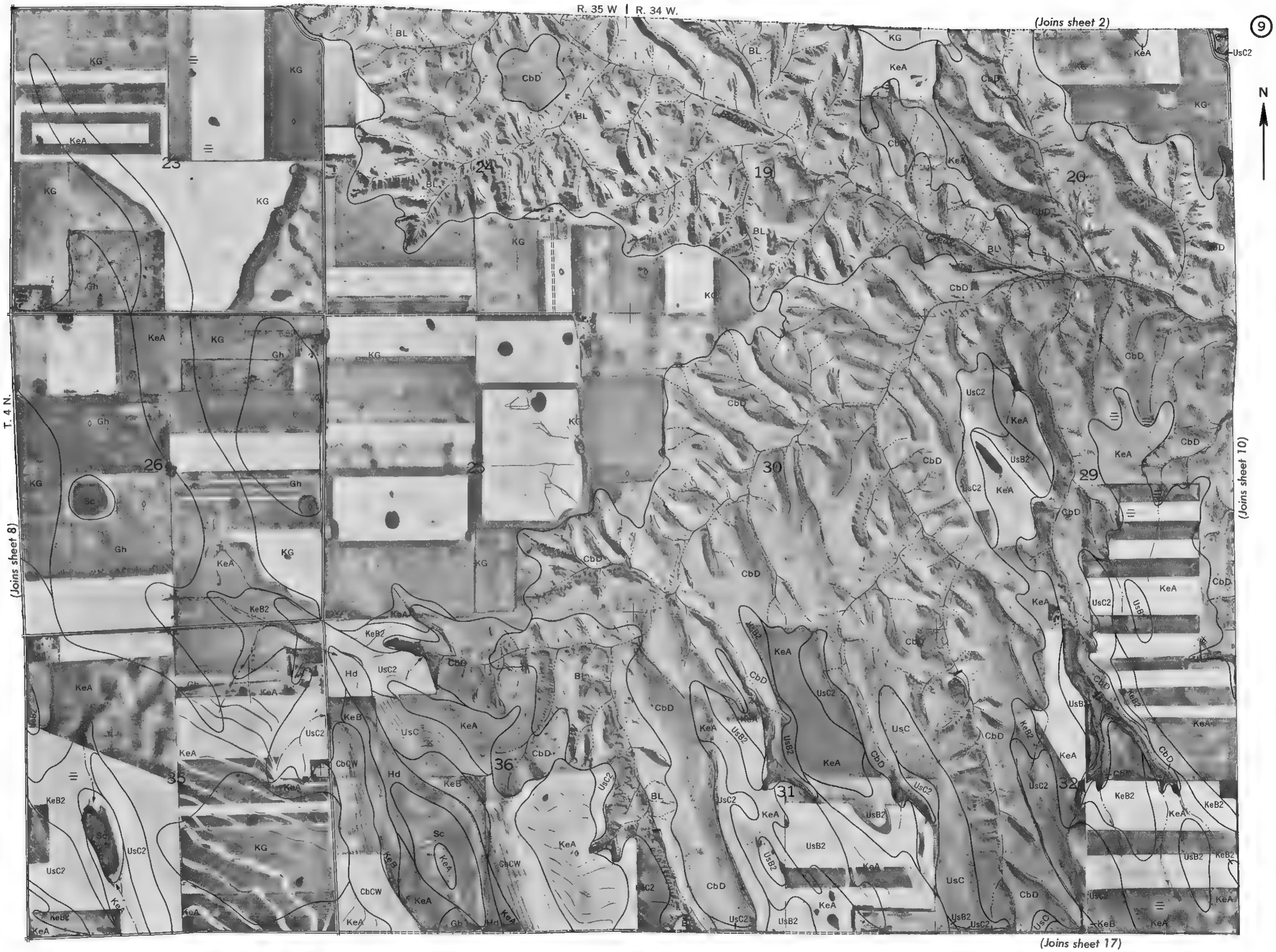

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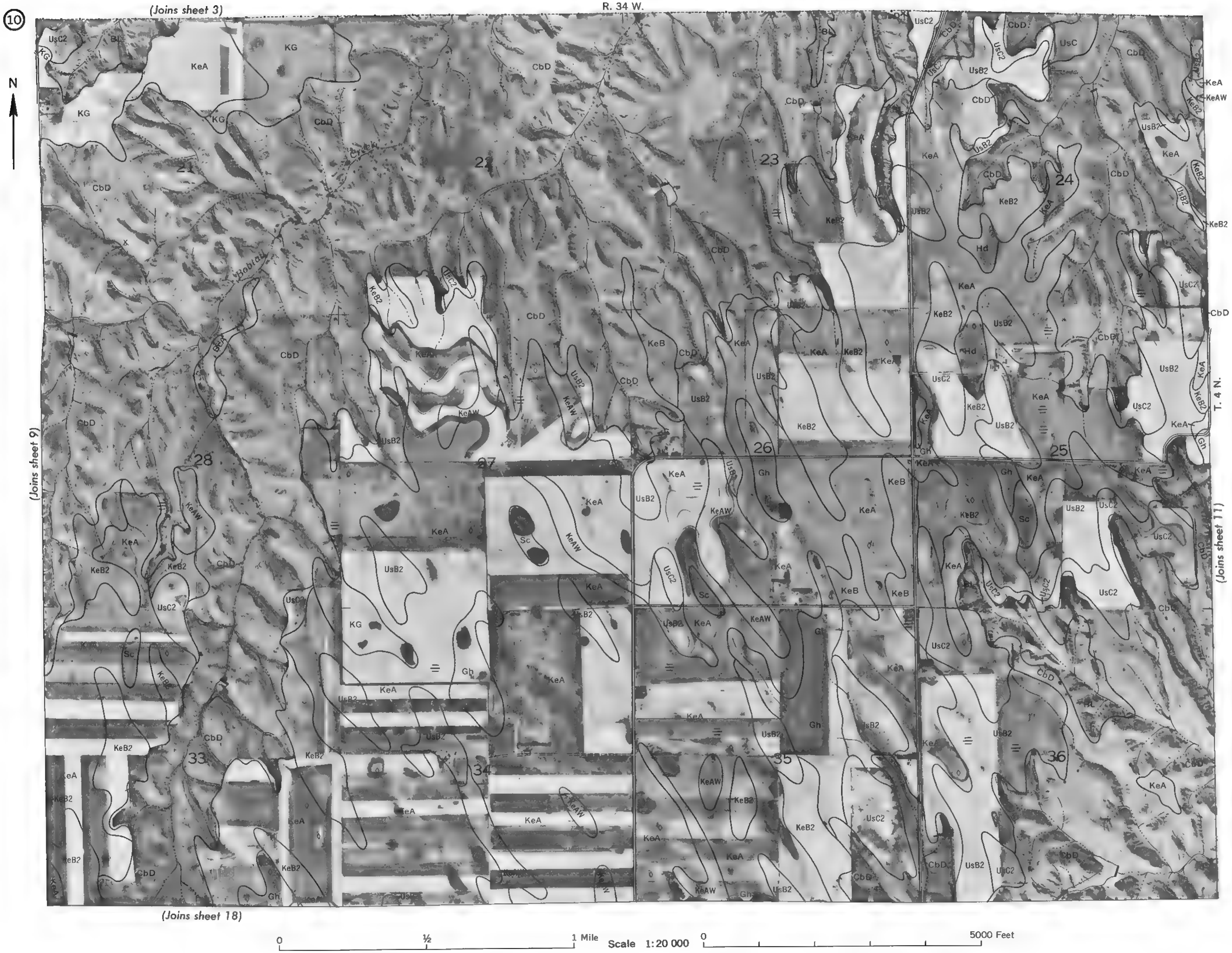
HITCHCOCK COUNTY, NEBRASKA NO. 9



HITCHCOCK COUNTY, NEBRASKA NO. 10

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HITCHCOCK COUNTY, NEBRASKA NO. 11

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0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

HITCHCOCK COUNTY, NEBRASKA NO. 12

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HITCHCOCK COUNTY, NEBRASKA NO. 13

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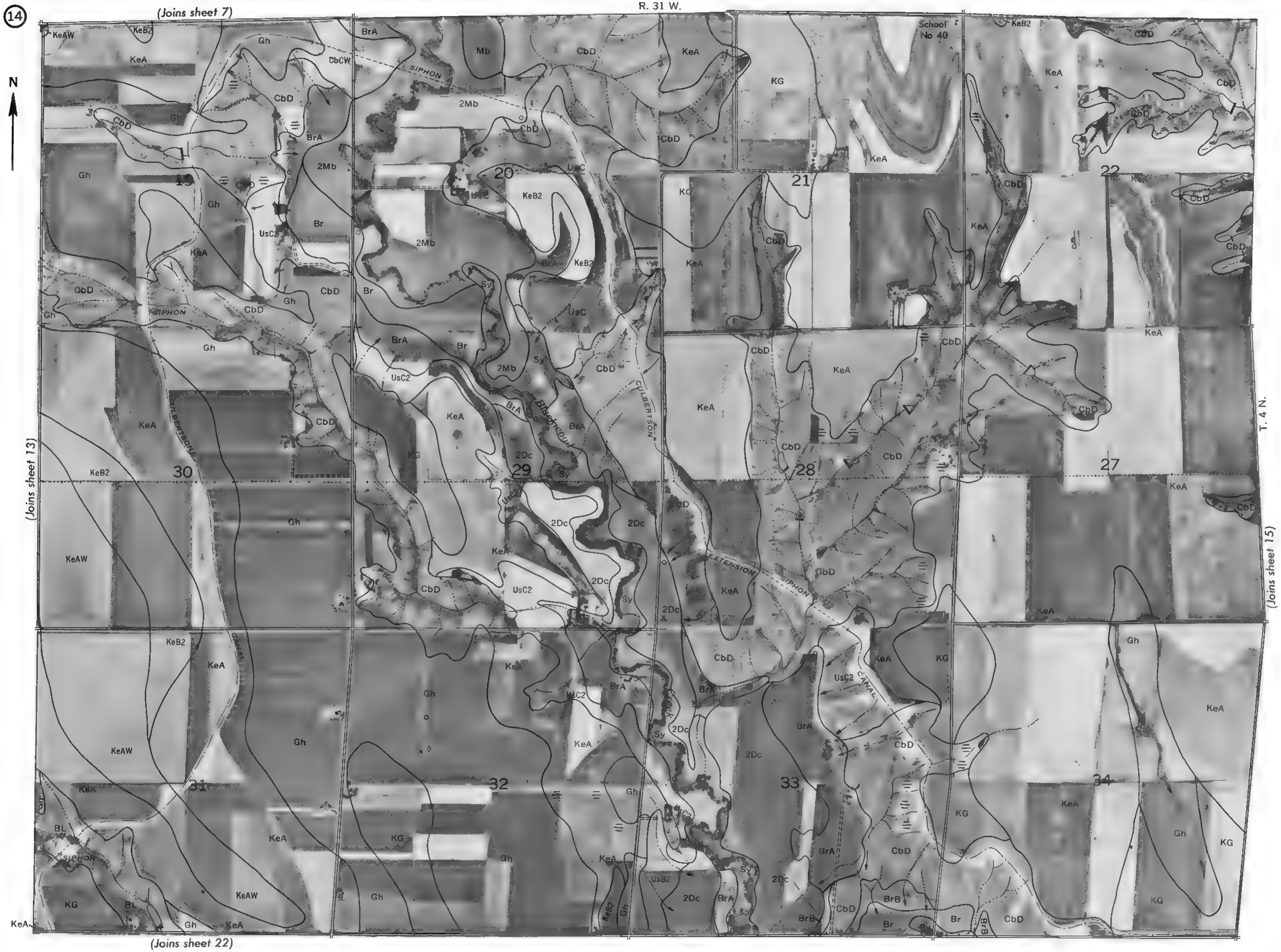

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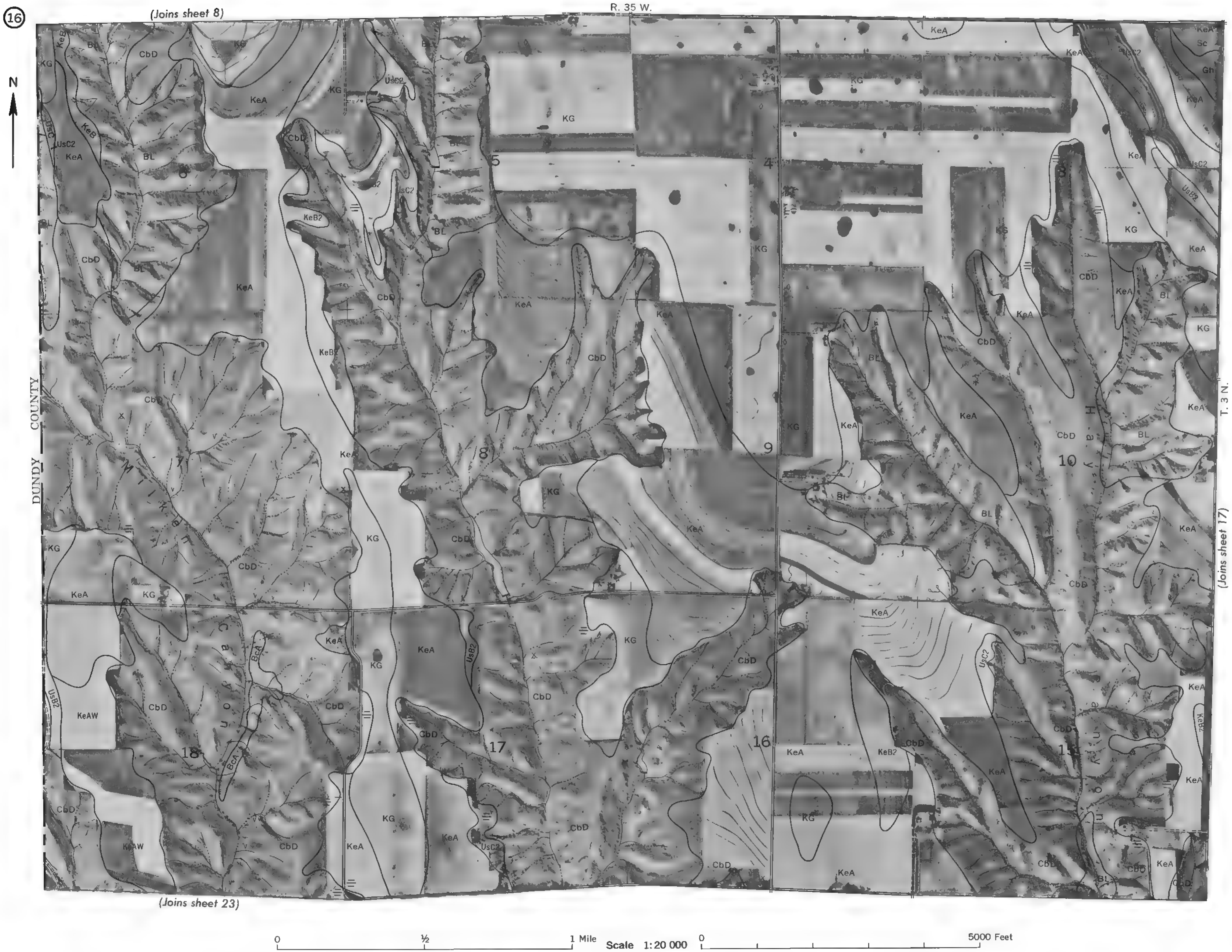
HITCHCOCK COUNTY, NEBRASKA NO. 15



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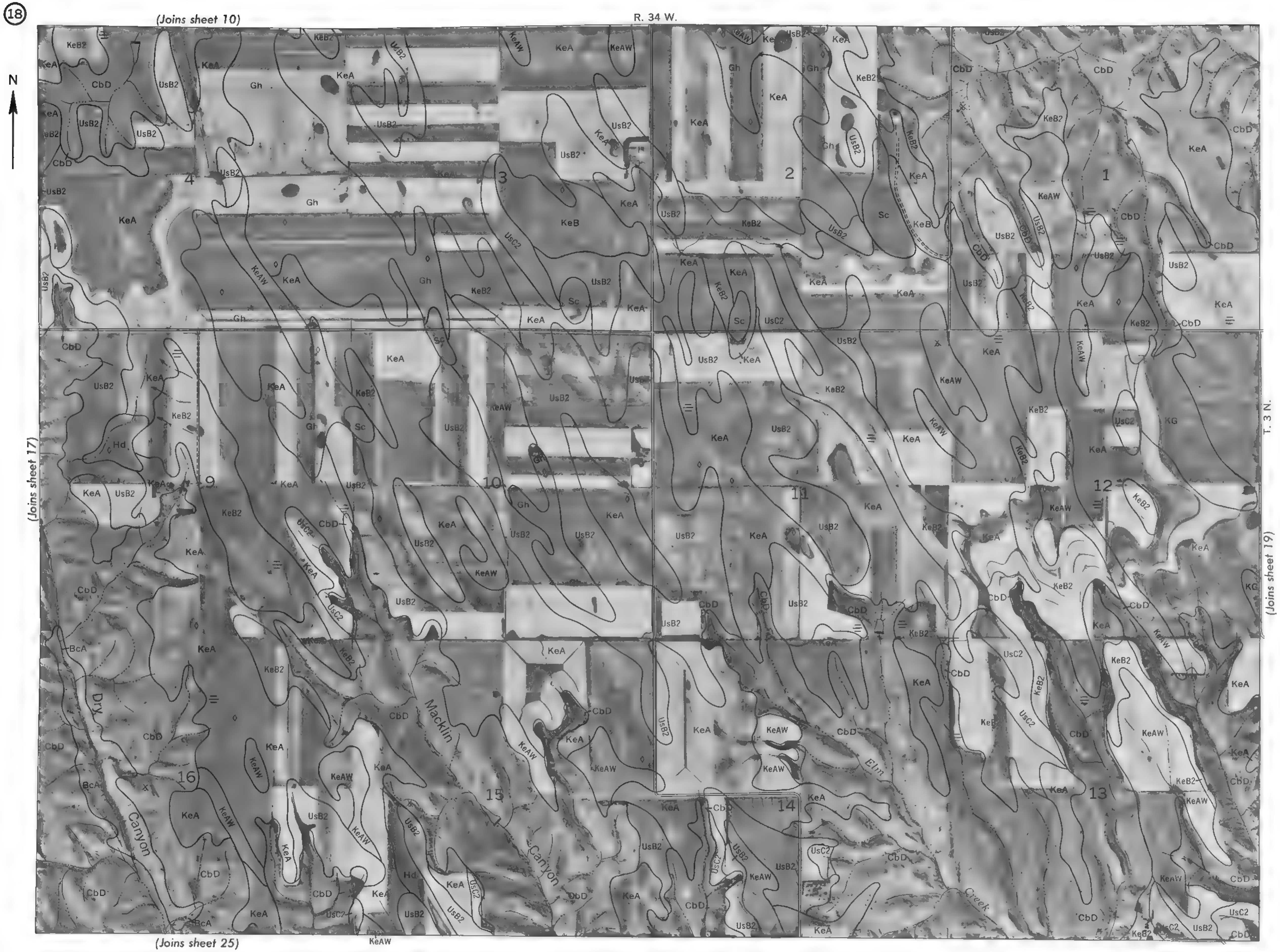
HITCHCOCK COUNTY, NEBRASKA NO. 17



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HITCHCOCK COUNTY, NEBRASKA NO. 19

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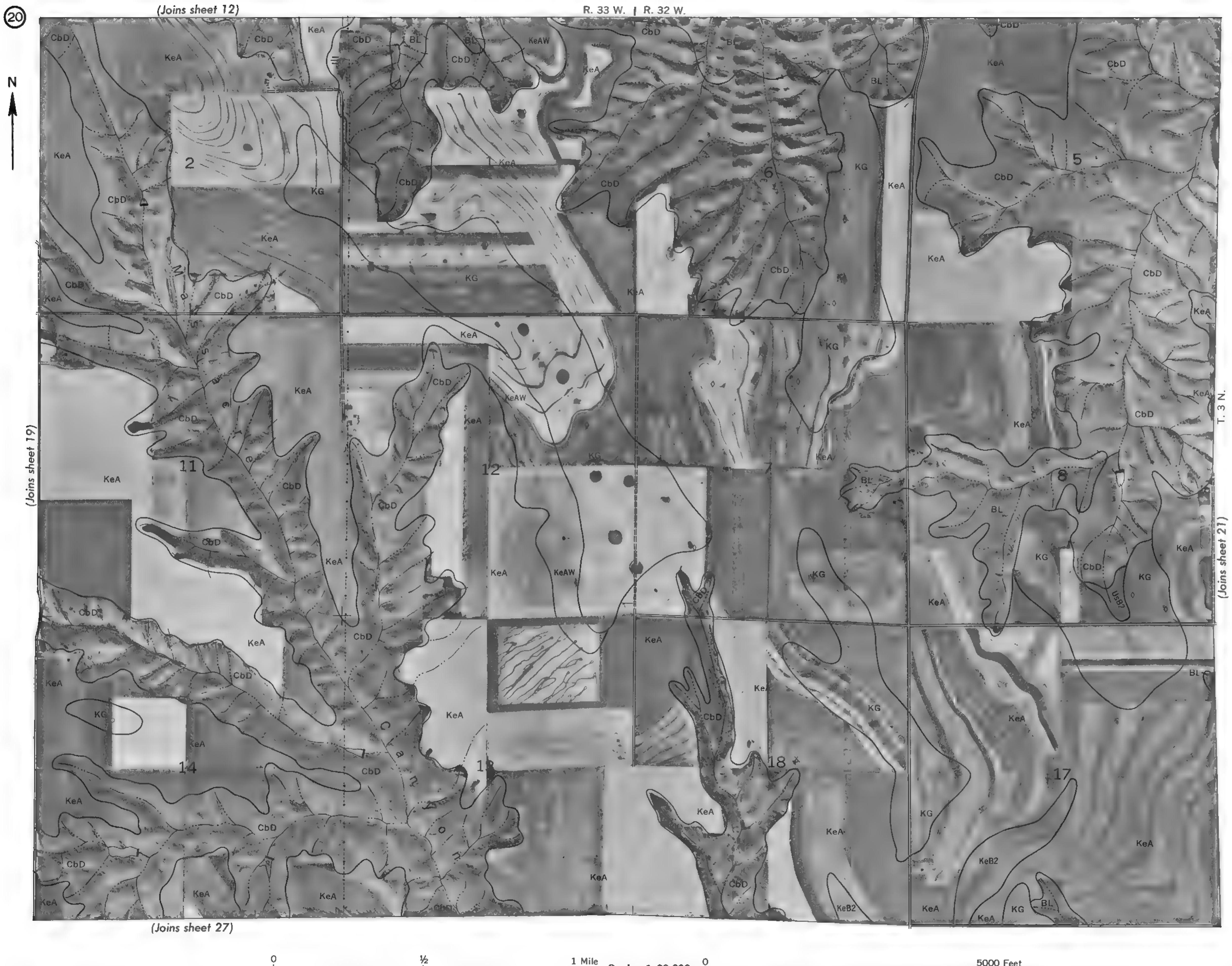

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HITCHCOCK COUNTY, NEBRASKA NO. 21

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HITCHCOCK COUNTY, NEBRASKA NO. 22

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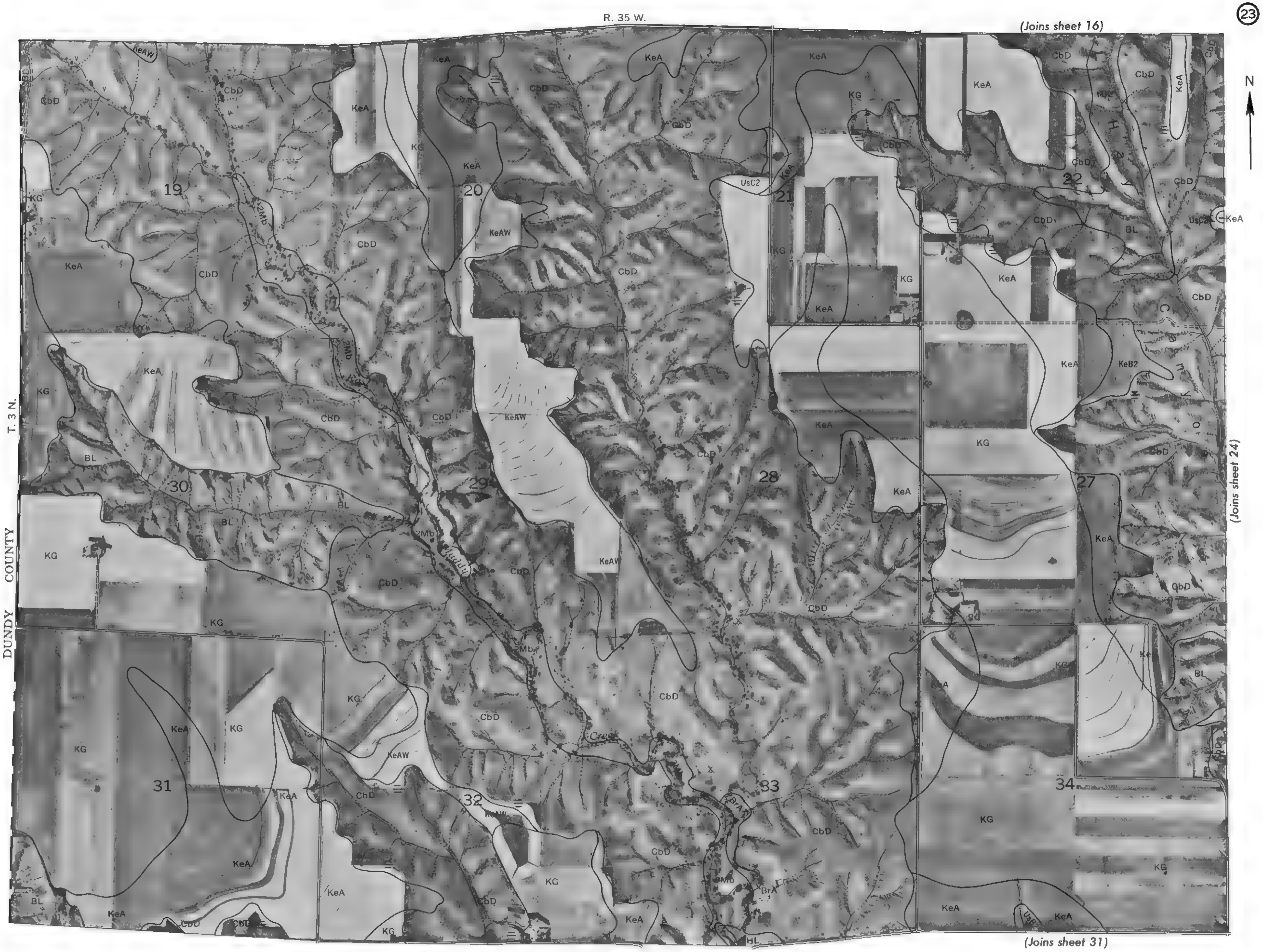

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HITCHCOCK COUNTY, NEBRASKA NO. 23

24

0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

HITCHCOCK COUNTY, NEBRASKA NO. 24

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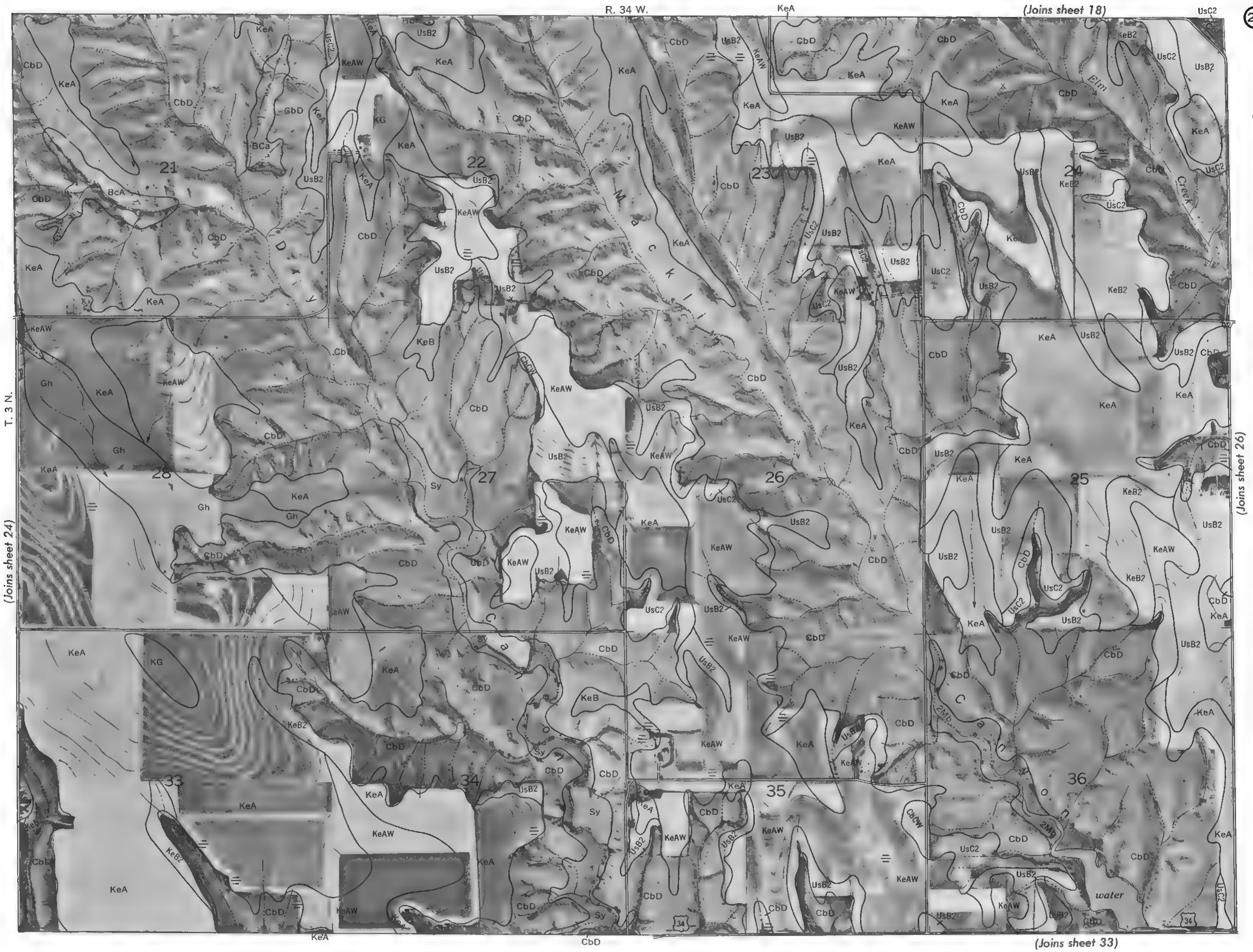

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HITCHCOCK COUNTY, NEBRASKA NO. 25

HITCHCOCK COUNTY, NEBRASKA NO. 26

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Land division corners are approximately positioned on this map.
HITCHCOCK COUNTY, NEBRASKA NO. 27

28

(Joins sheet 21)

R. 32 W.

(Joins sheet 27)

T. 3 N.

(Joins sheet 29)

(Joins sheet 36)

0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

HITCHCOCK COUNTY, NEBRASKA NO. 28

This map is one of a set compiled in 1967 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Nebraska, Conservation and Survey Division.

Land division corners are approximately positioned on this map.

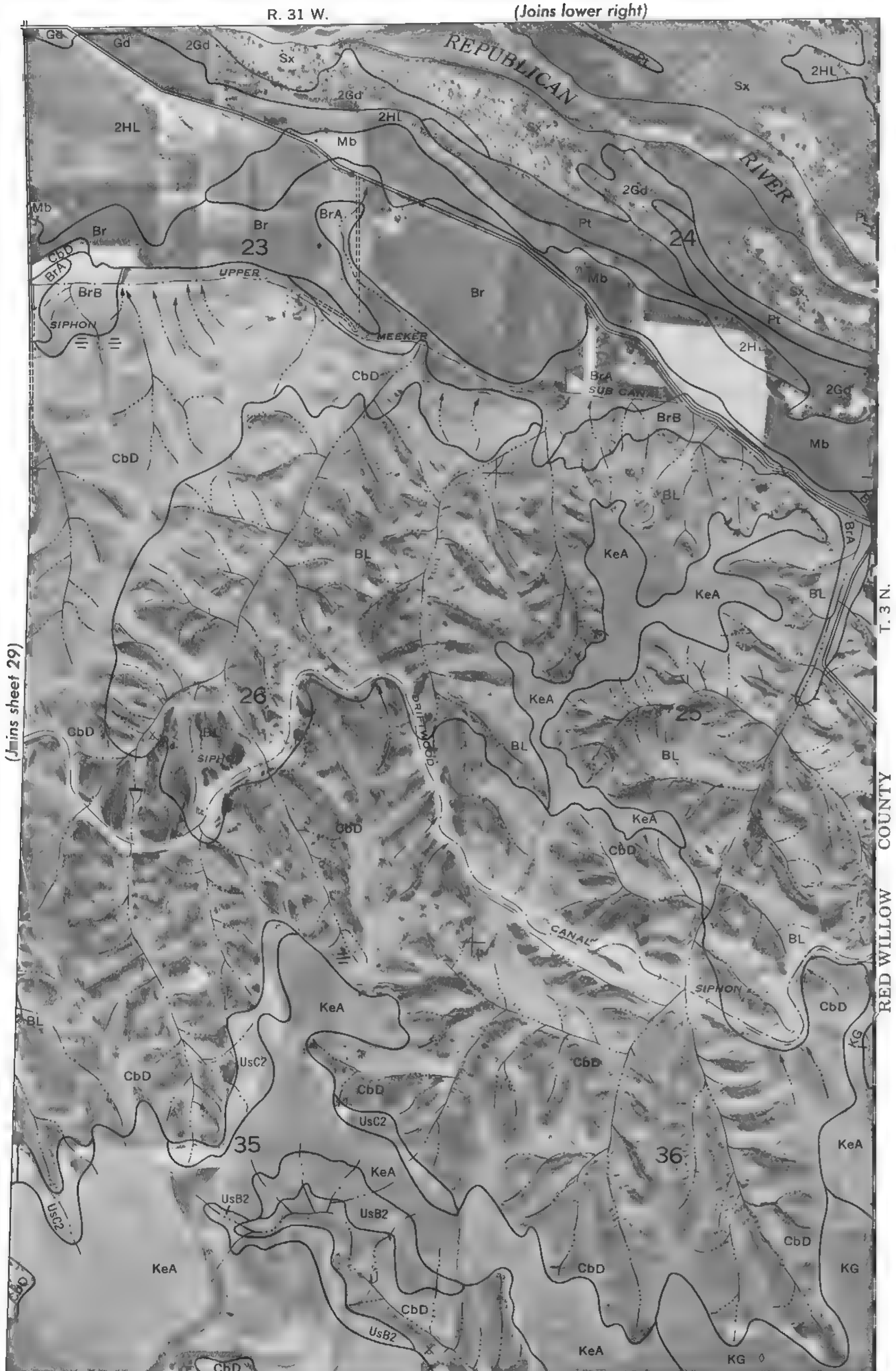
HITCHCOCK COUNTY, NEBRASKA NO. 29

(30)

R. 31 W. (Joins lower right)

N

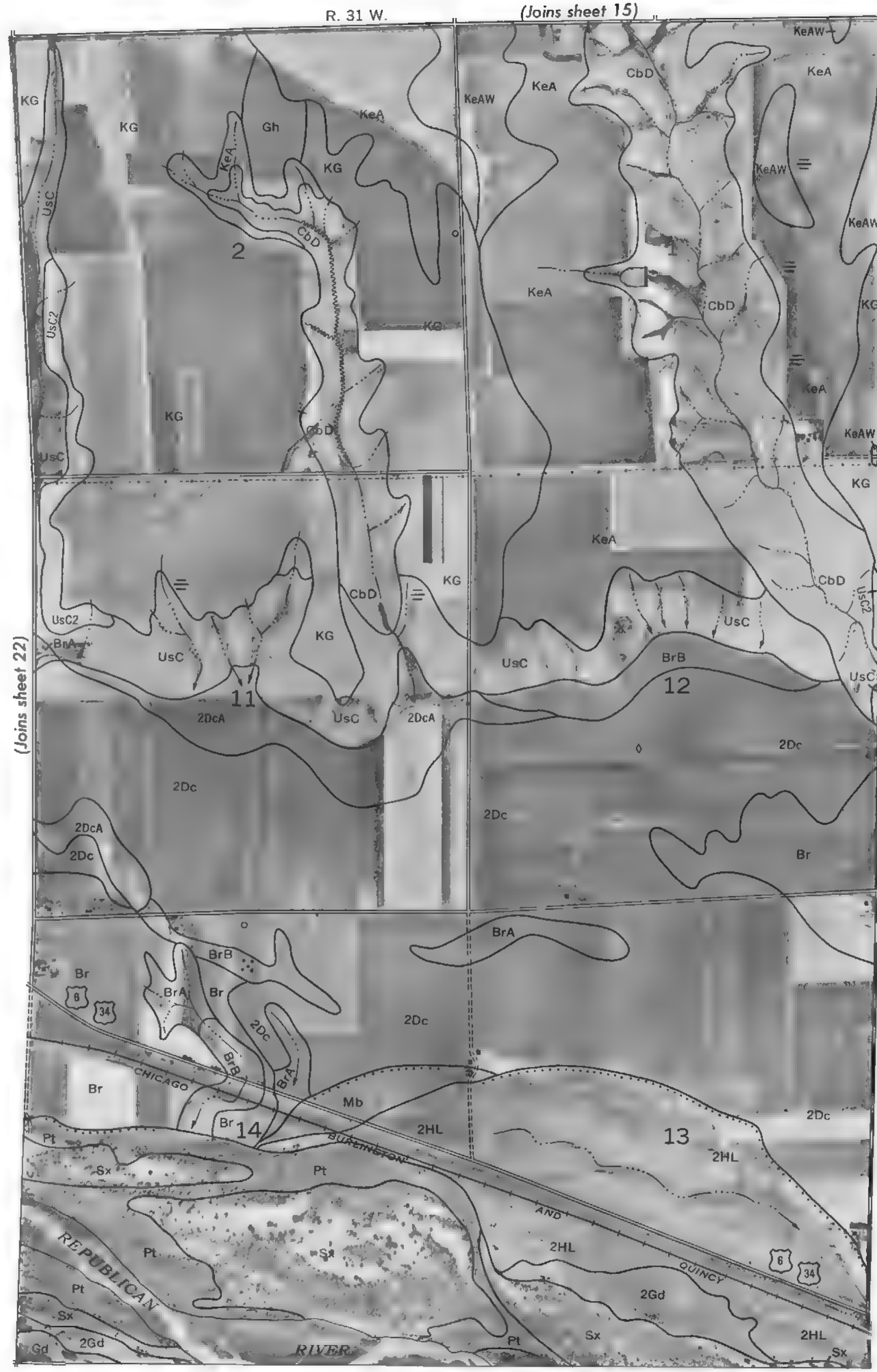
(Joins sheet 29)



(Joins inset, sheet 45)

R. 31 W. (Joins sheet 15)

(Joins sheet 22)



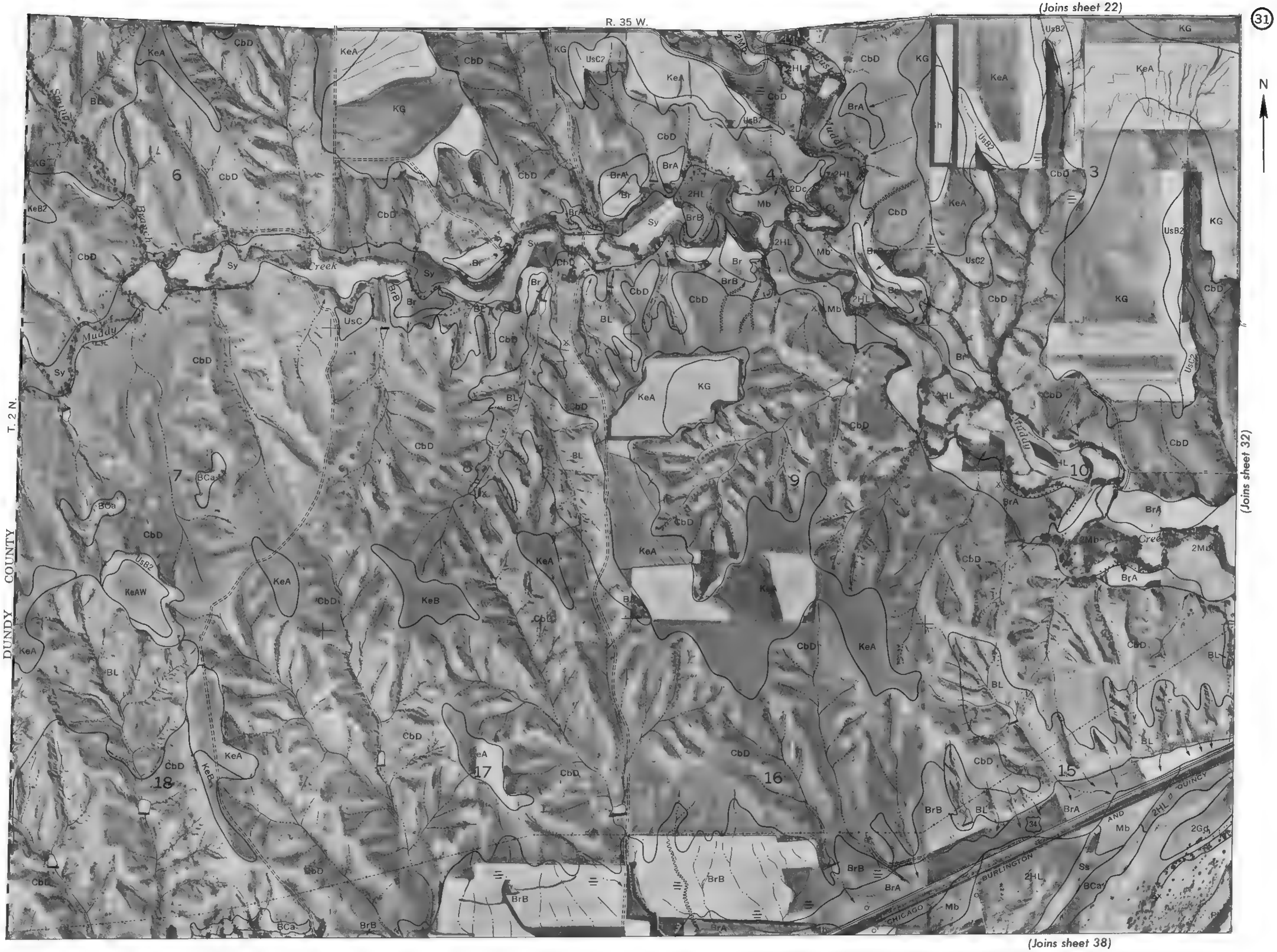
(Joins upper left)

0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

HITCHCOCK COUNTY, NEBRASKA NO. 30

This map is one of a set compiled in 1967 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Nebraska, Conservation and Survey Division

Land division corners are approximately positioned on this map.



0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

This map is one of a set compiled in 1967 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Nebraska, Conservation and Survey Division.

Land division corners are approximately positioned on this map.

HITCHCOCK COUNTY, NEBRASKA NO. 31

0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

HITCHCOCK COUNTY, NEBRASKA NO. 32

This map is one of a set compiled in 1967 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Nebraska, Conservation and Survey Division.

Land division corners are approximately positioned on this map.

This map is one of a set compiled in 1967 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Nebraska, Conservation and Survey Division

Land division corners are approximately positioned on this map.

HITCHCOCK COUNTY, NEBRASKA NO. 33

0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

HITCHCOCK COUNTY, NEBRASKA NO. 34

This map is one of a set compiled in 1967 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Nebraska, Conservation and Survey Division.

Land division corners are approximately positioned on this map.

0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

This map is one of a set compiled in 1967 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Nebraska, Conservation and Survey Division
Land division corners are approximately positioned on this map.
HITCHCOCK COUNTY, NEBRASKA NO. 35

36

HITCHCOCK COUNTY, NEBRASKA NO. 36

This map is one of a set compiled in 1967 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Nebraska, Conservation and Survey Division.

Land division corners are approximately positioned on this map.

(37)

This map is one of a set compiled in 1967 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Nebraska, Conservation and Survey Division.
Land division corners are approximately positioned on this map.

HITCHCOCK COUNTY, NEBRASKA NO. 37

0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

HITCHCOCK COUNTY, NEBRASKA NO. 38

This map is one of a set compiled in 1967 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Nebraska, Conservation and Survey Division.

Land division corners are approximately positioned on this map.

0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

This map is one of a set compiled in 1967 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Nebraska, Conservation and Survey Division.
Land division corners are approximately positioned on this map.
HITCHCOCK COUNTY, NEBRASKA NO. 39

0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

HITCHCOCK COUNTY, NEBRASKA NO. 40

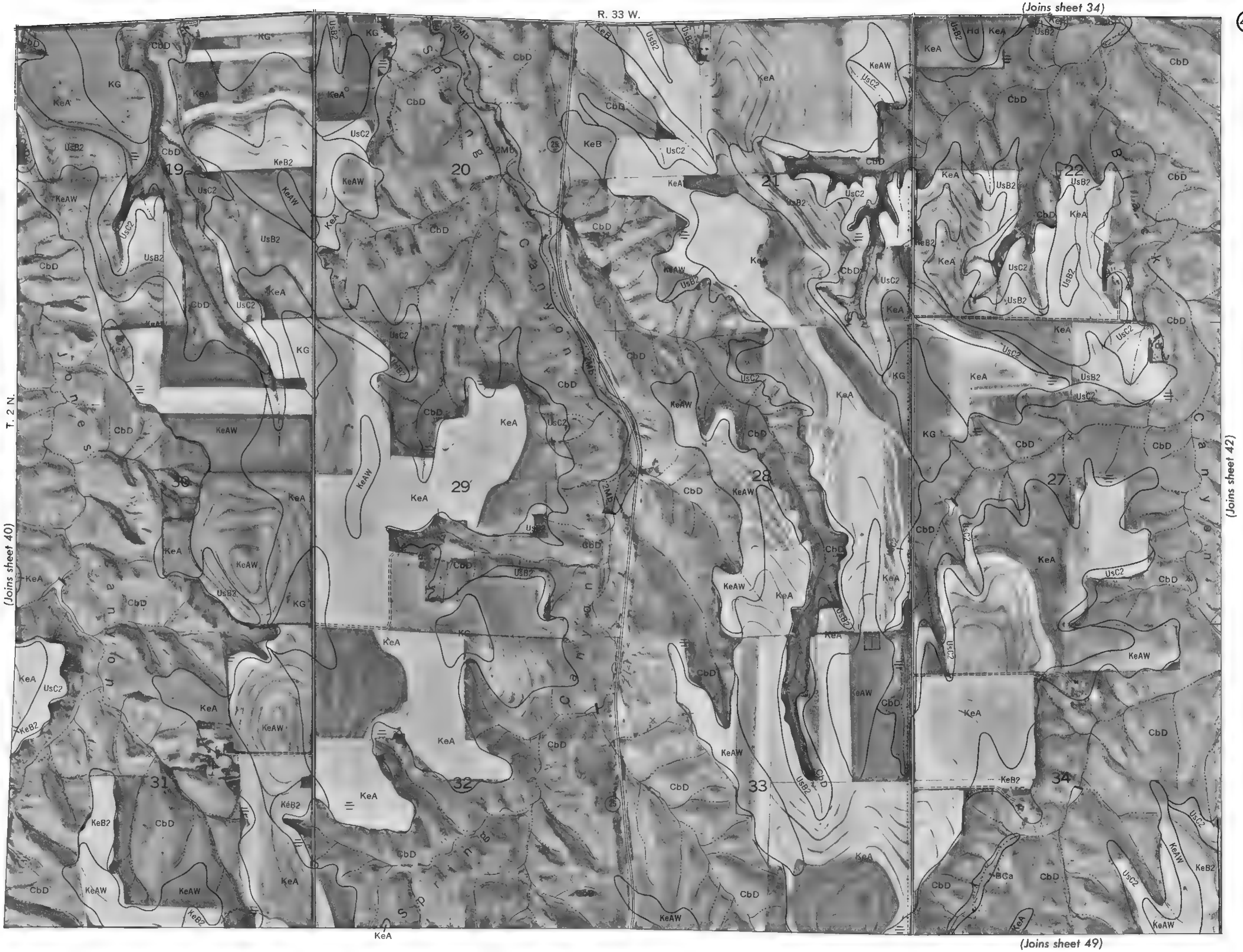
This map is one of a set compiled in 1967 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Nebraska, Conservation and Survey Division

Land division corners are approximately positioned on this map.

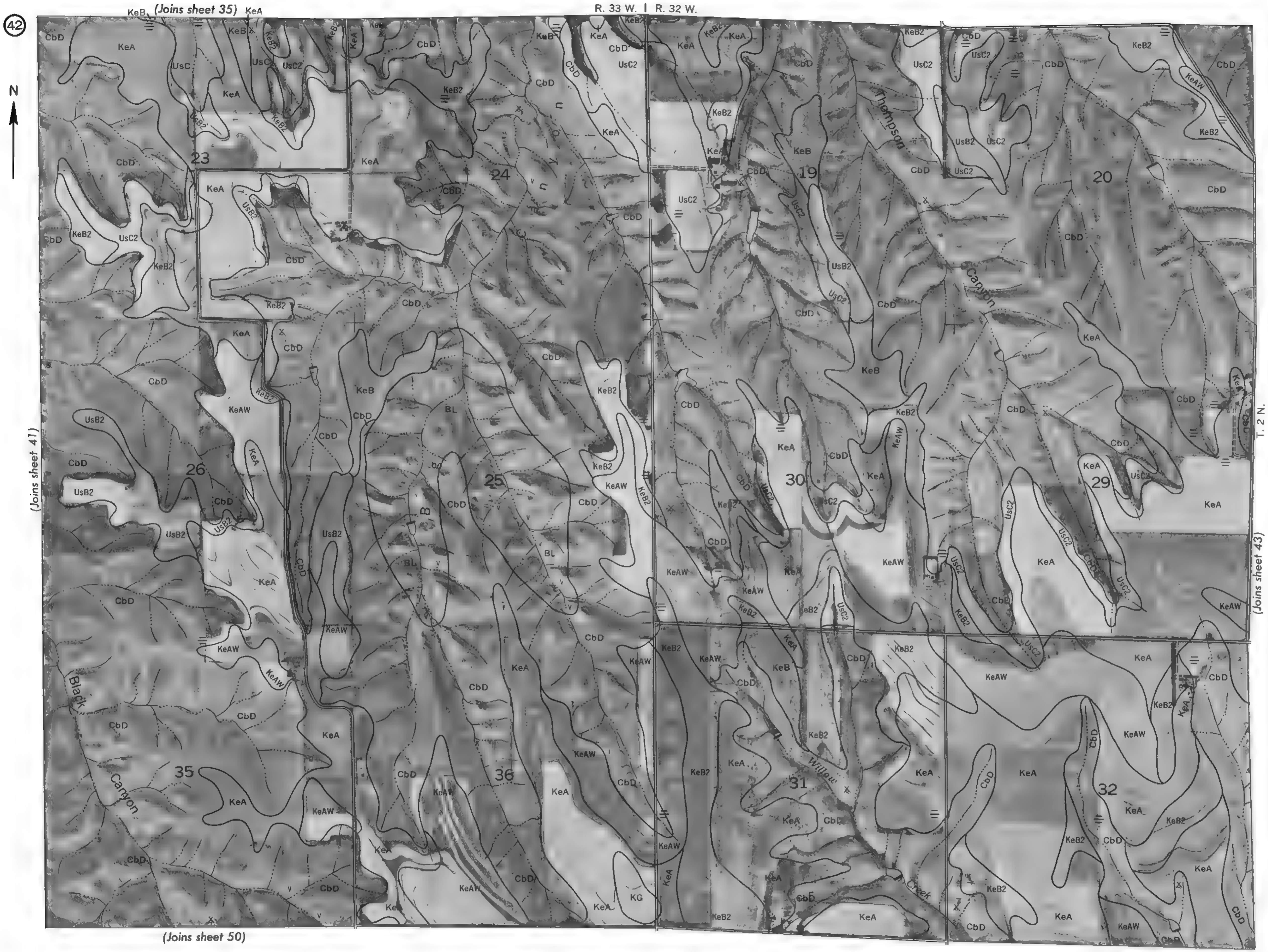
This map is one of a set compiled in 1967 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Nebraska, Conservation and Survey Division

Land division corners are approximately positioned on this map.

HITCHCOCK COUNTY, NEBRASKA NO. 41



0 ½ 1 Mile Scale 1:20 000 0 5000 Feet



0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

HITCHCOCK COUNTY, NEBRASKA NO. 42

This map is one of a set compiled in 1967 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Nebraska, Conservation and Survey Division

Land division corners are approximately positioned on this map

0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

This map is one of a set compiled in 1967 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Nebraska, Conservation and Survey Division.
Land division corners are approximately positioned on this map
HITCHCOCK COUNTY, NEBRASKA NO. 43

0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

HITCHCOCK COUNTY, NEBRASKA NO. 44

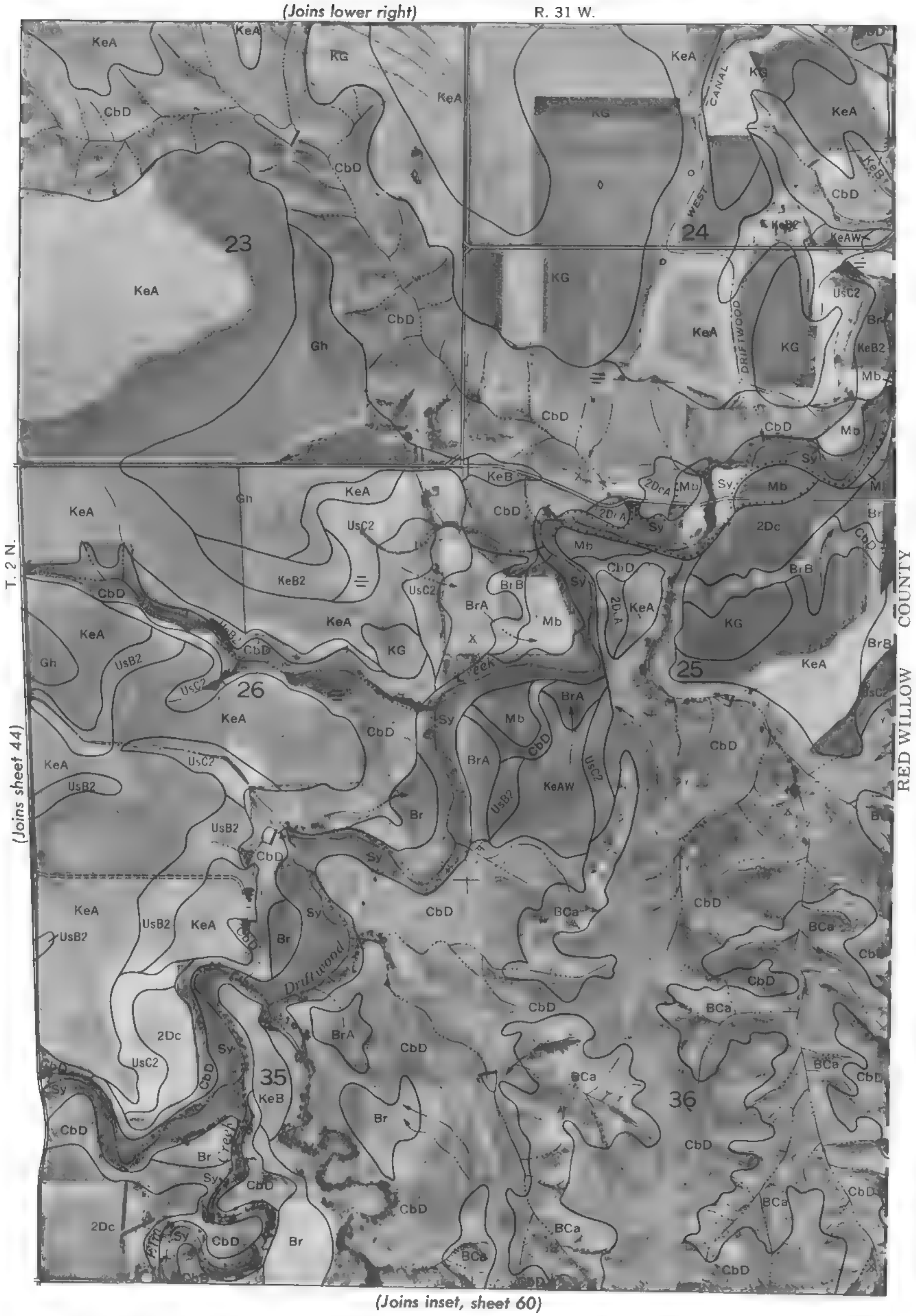
This map is one of a set compiled in 1967 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Nebraska, Conservation and Survey Division.

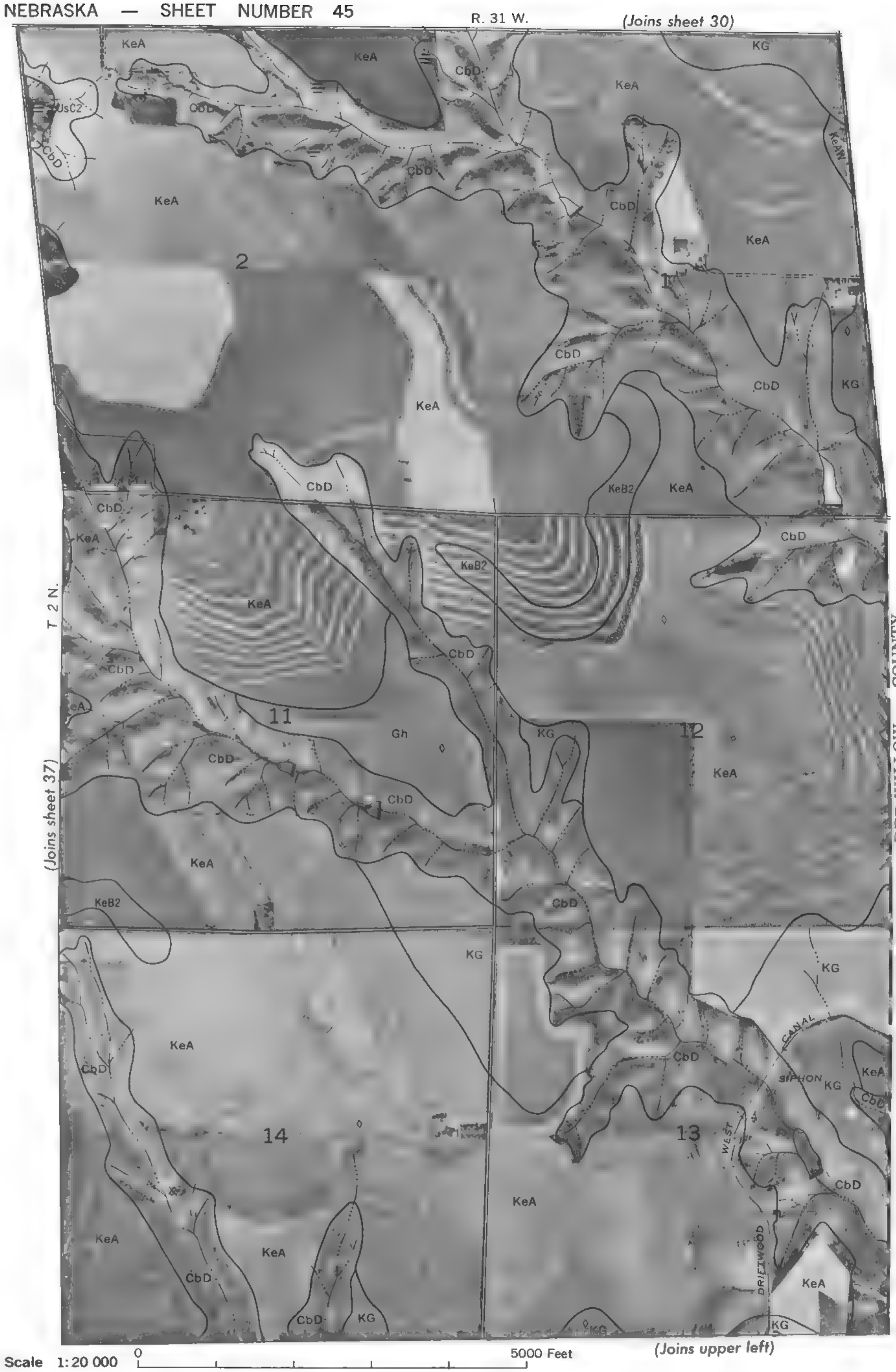
Land division corners are approximately positioned on this map.

This map is one of a set compiled in 1967 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Nebraska, Conservation and Survey Division.

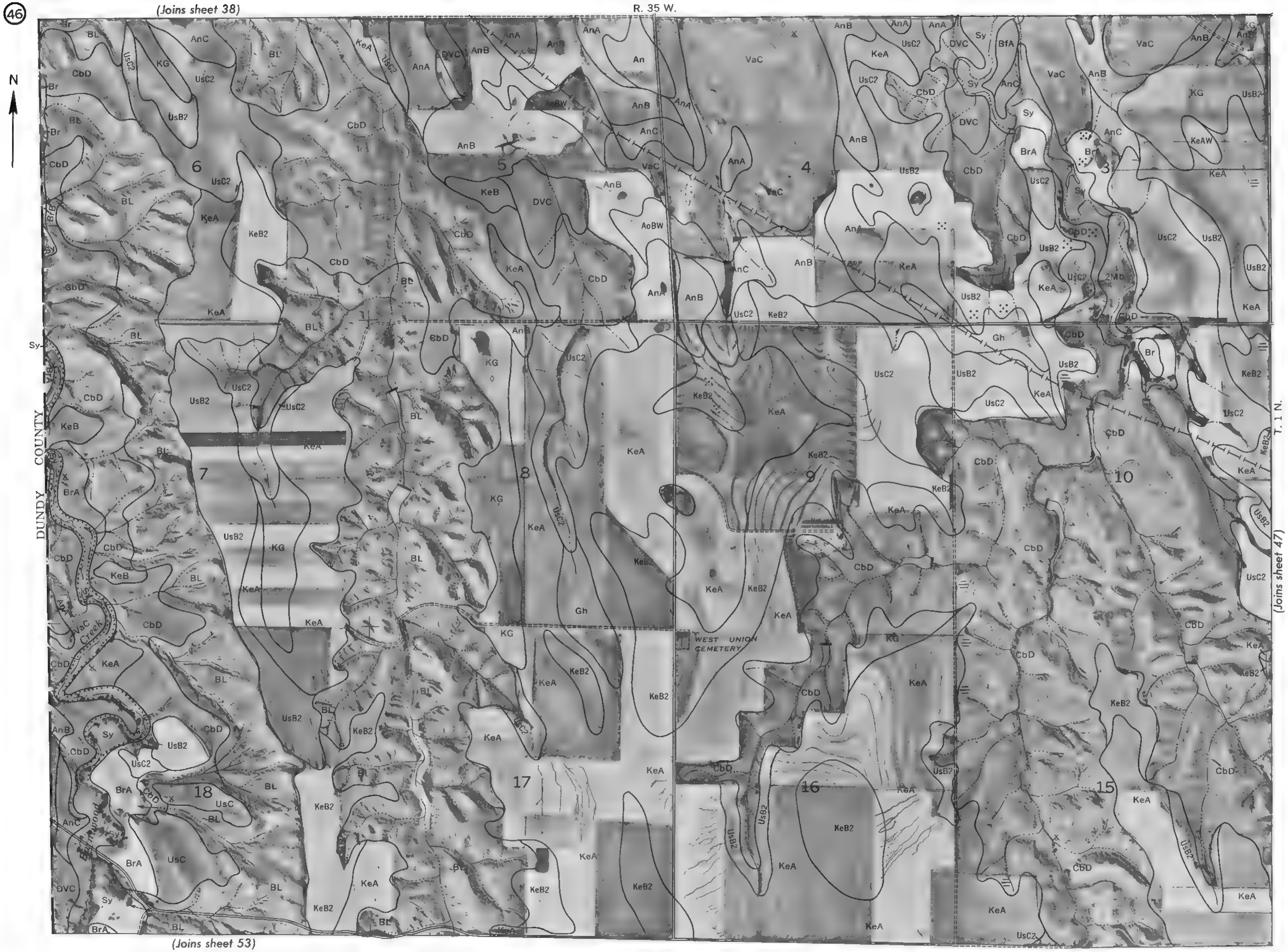
Land division corners are approximately positioned on this map.

HITCHCOCK COUNTY, NEBRASKA NO. 45





0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

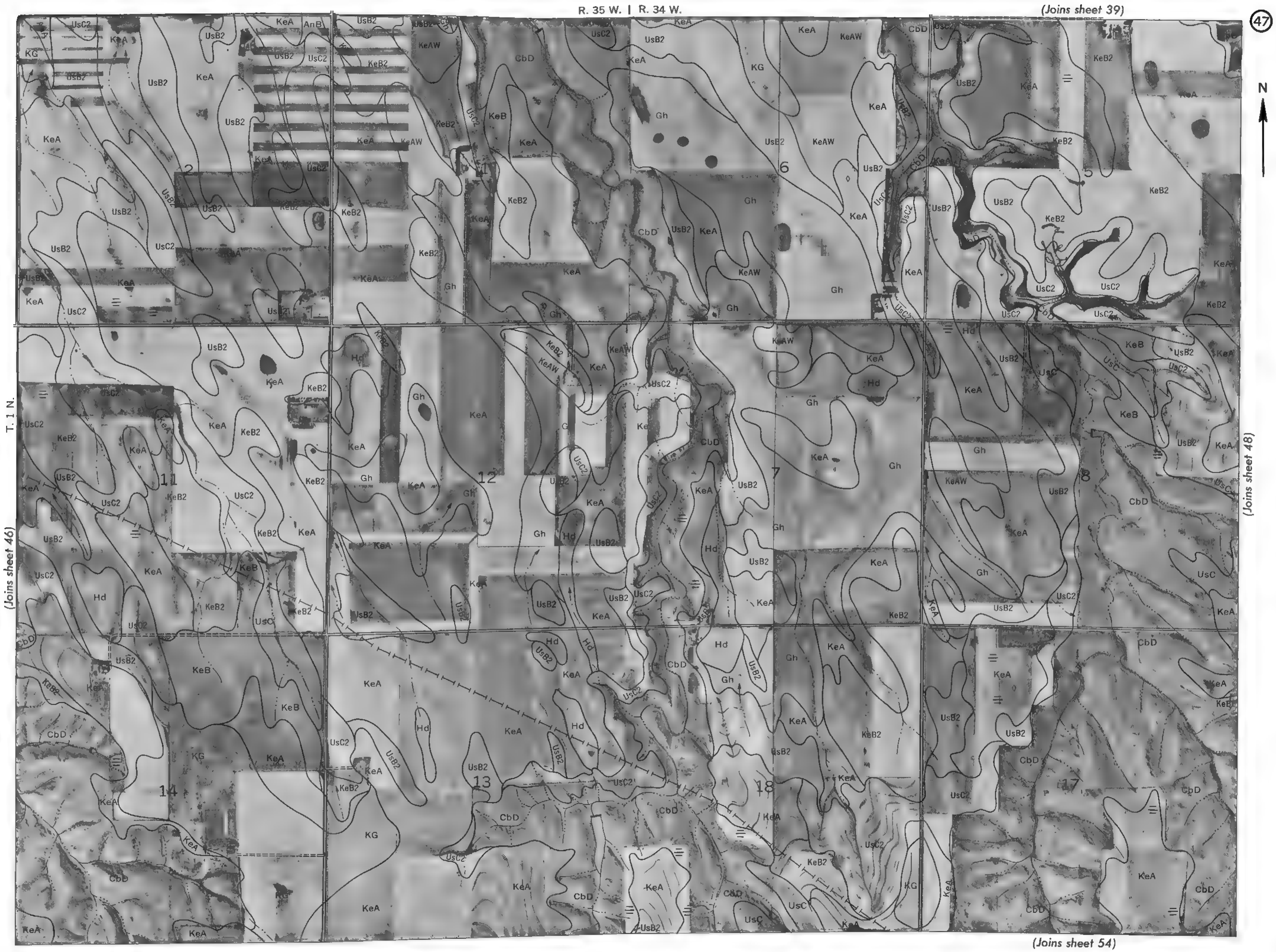


0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

HITCHCOCK COUNTY, NEBRASKA NO. 46

This map is one of a set compiled in 1967 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Nebraska, Conservation and Survey Division.

Land division corners are approximately positioned on this map.



0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

This map is one of a set compiled in 1967 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Nebraska, Conservation and Survey Division.
Land division corners are approximately positioned on this map.
HITCHCOCK COUNTY, NEBRASKA NO. 47

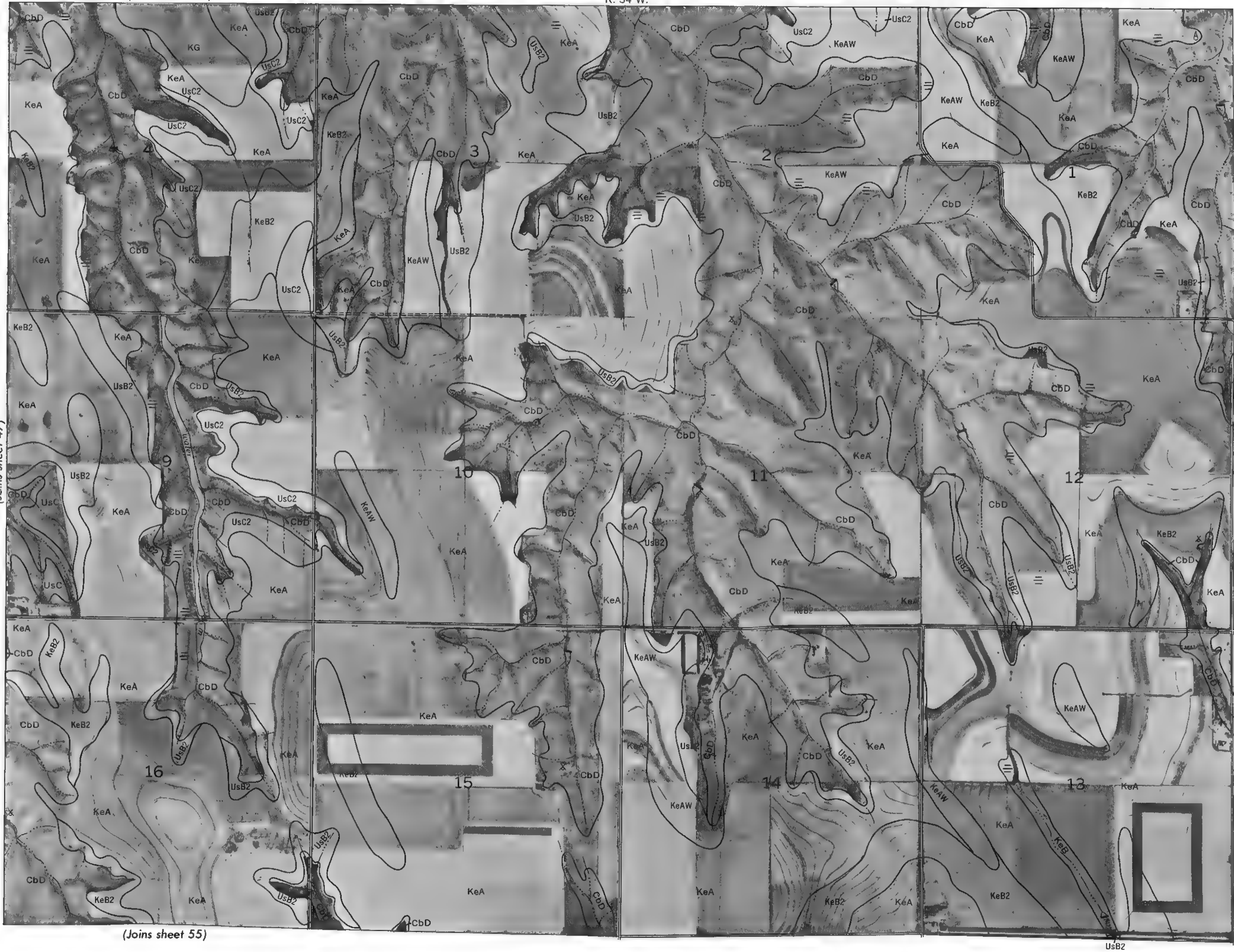
(48)

(Joins sheet 40)

R. 34 W.

N

(Joins sheet 47)



T. 1 N.

(Joins sheet 49)

(Joins sheet 55)

0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

HITCHCOCK COUNTY, NEBRASKA NO. 48

This map is one of a set compiled in 1967 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Nebraska, Conservation and Survey Division

Land division corners are approximately positioned on this map.

Scale 1:20 000

0 ½ 1 Mile

0 5000 Feet

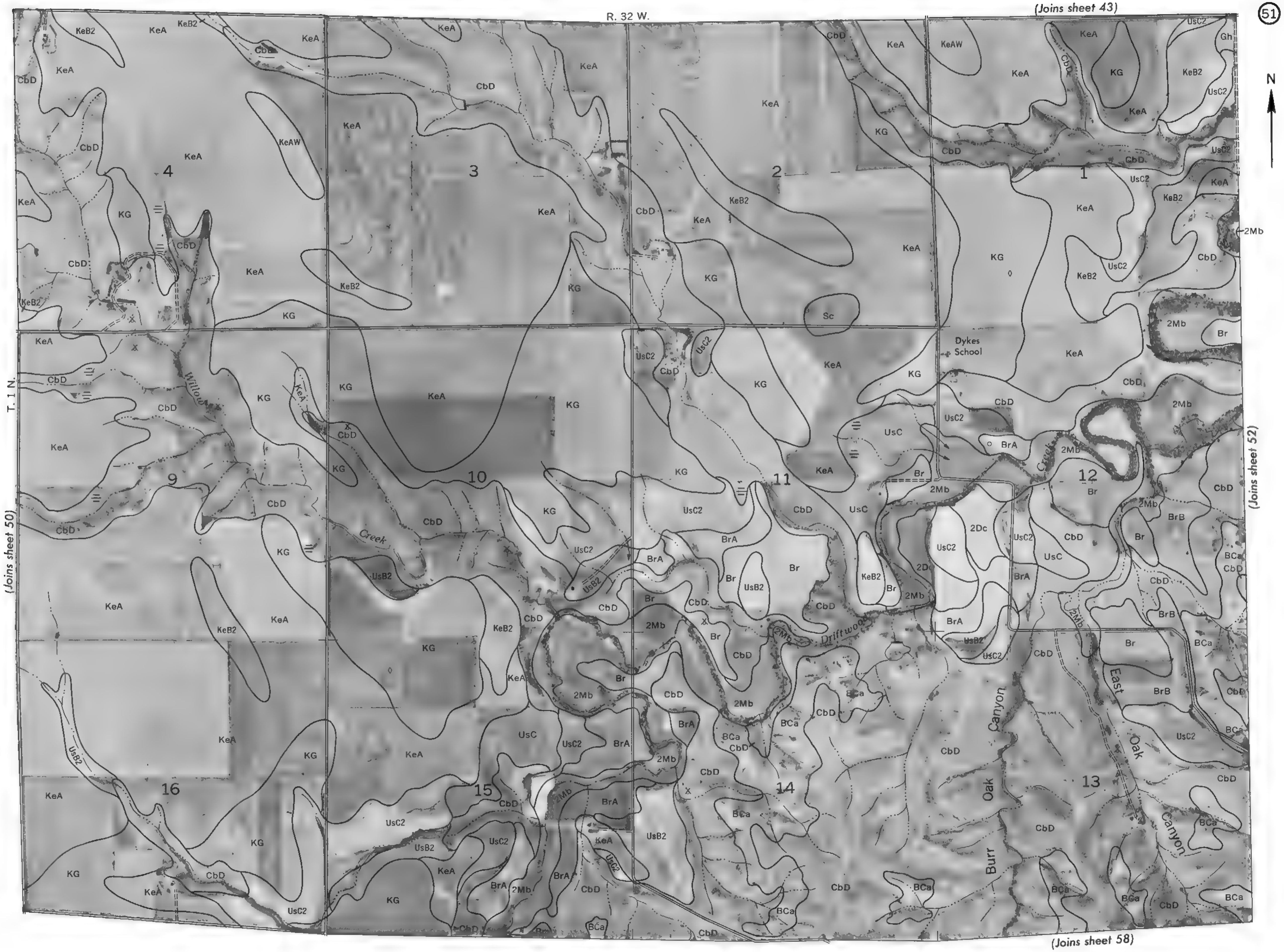
Land division corners are approximately positioned on this map.

HITCHCOCK COUNTY, NEBRASKA NO. 49

HITCHCOCK COUNTY, NEBRASKA NO. 50

This map is one of a set compiled in 1967 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Nebraska, Conservation and Survey Division.

Land division corners are approximately positioned on this map.

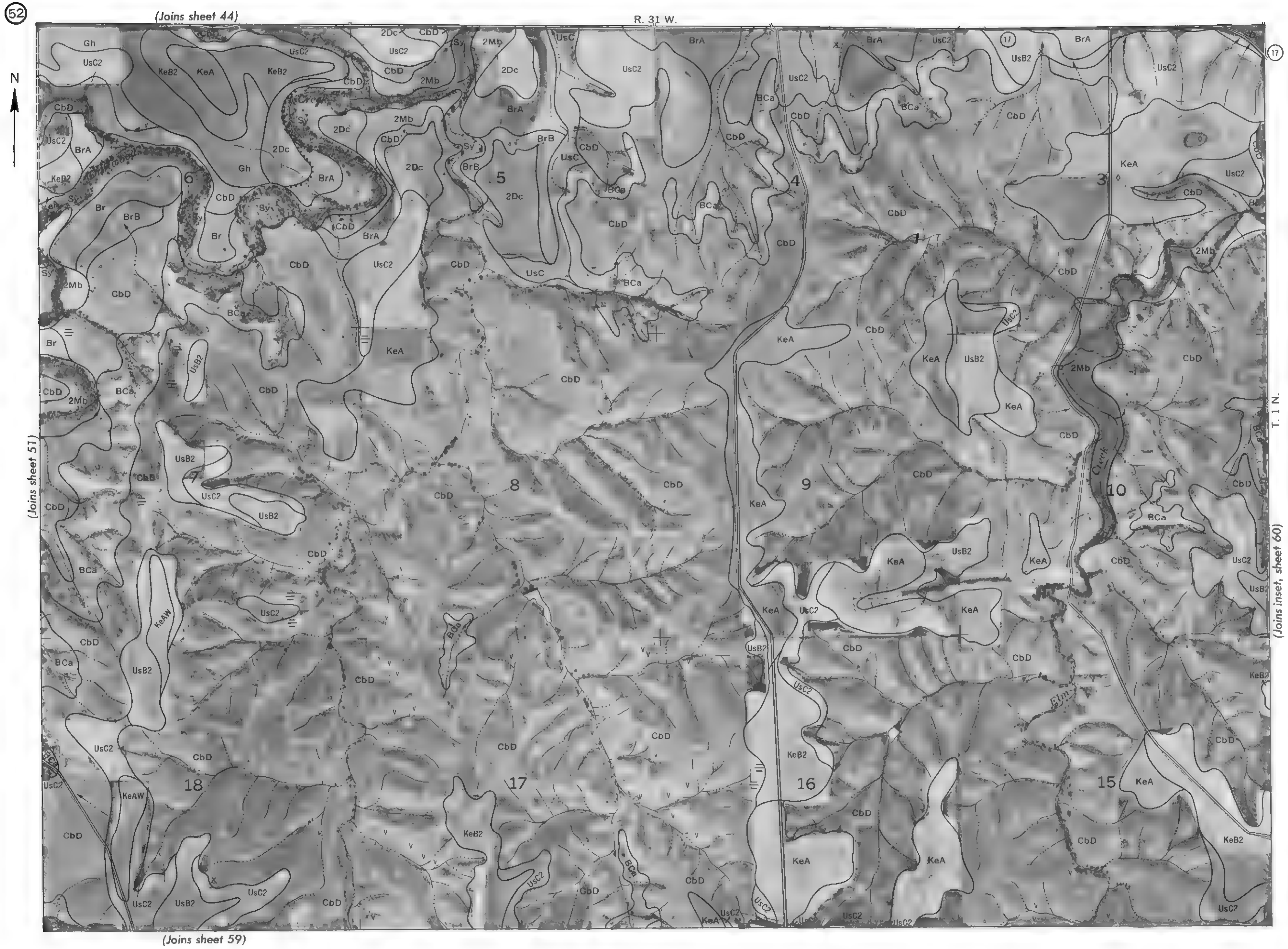


0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

This map is one of a set compiled in 1967 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Nebraska, Conservation and Survey Division

Land division corners are approximately positioned on this map.

HITCHCOCK COUNTY, NEBRASKA NO. 51



0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

HITCHCOCK COUNTY, NEBRASKA NO. 52

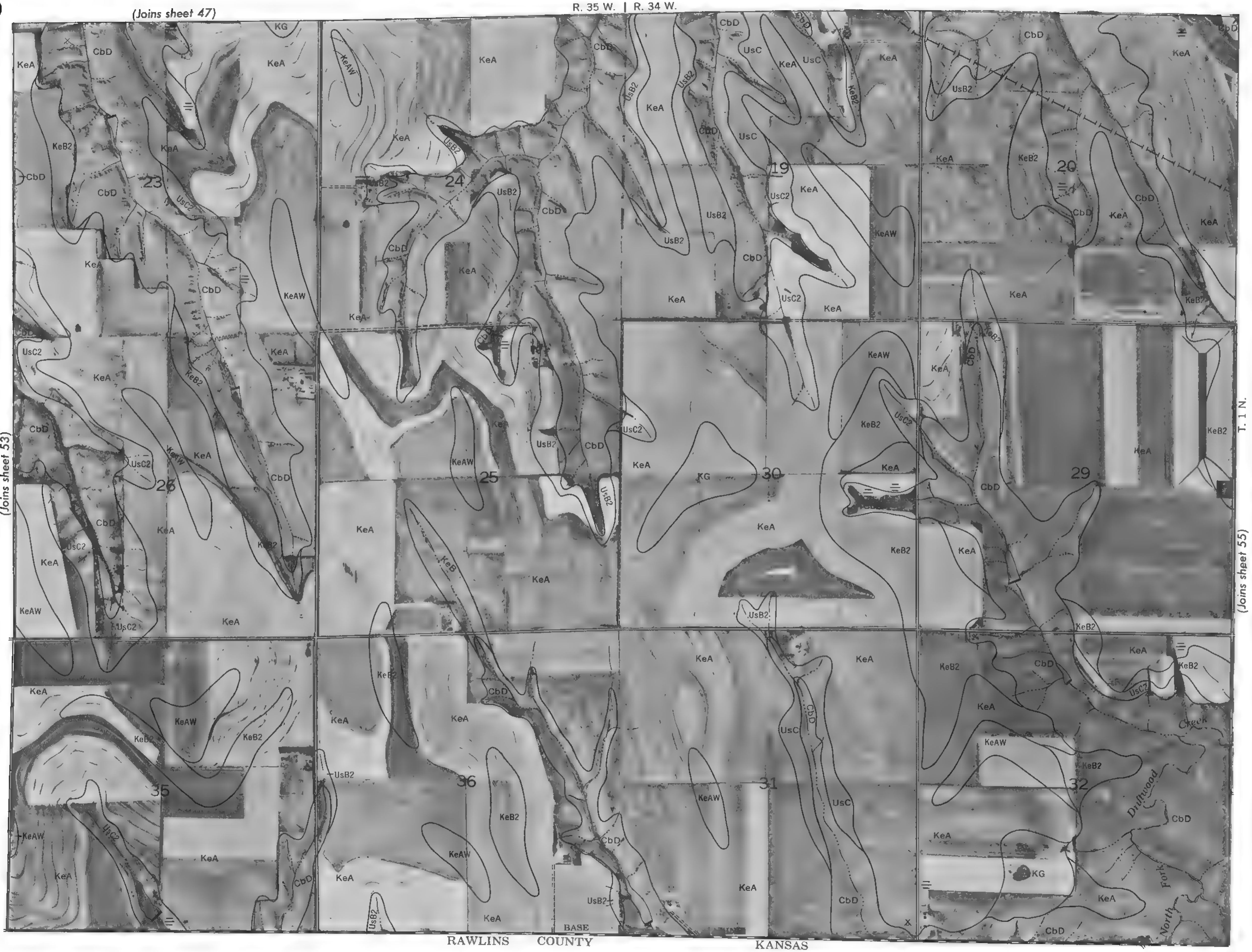
This map is one of a set compiled in 1967 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Nebraska, Conservation and Survey Division.

Land division corners are approximately positioned on this map.

0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

This map is one of a set compiled in 1967 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Nebraska, Conservation and Survey Division.
Land division corners are approximately positioned on this map.
HITCHCOCK COUNTY, NEBRASKA NO. 53

54



0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

HITCHCOCK COUNTY, NEBRASKA NO. 54

This map is one of a set compiled in 1967 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Nebraska, Conservation and Survey Division.

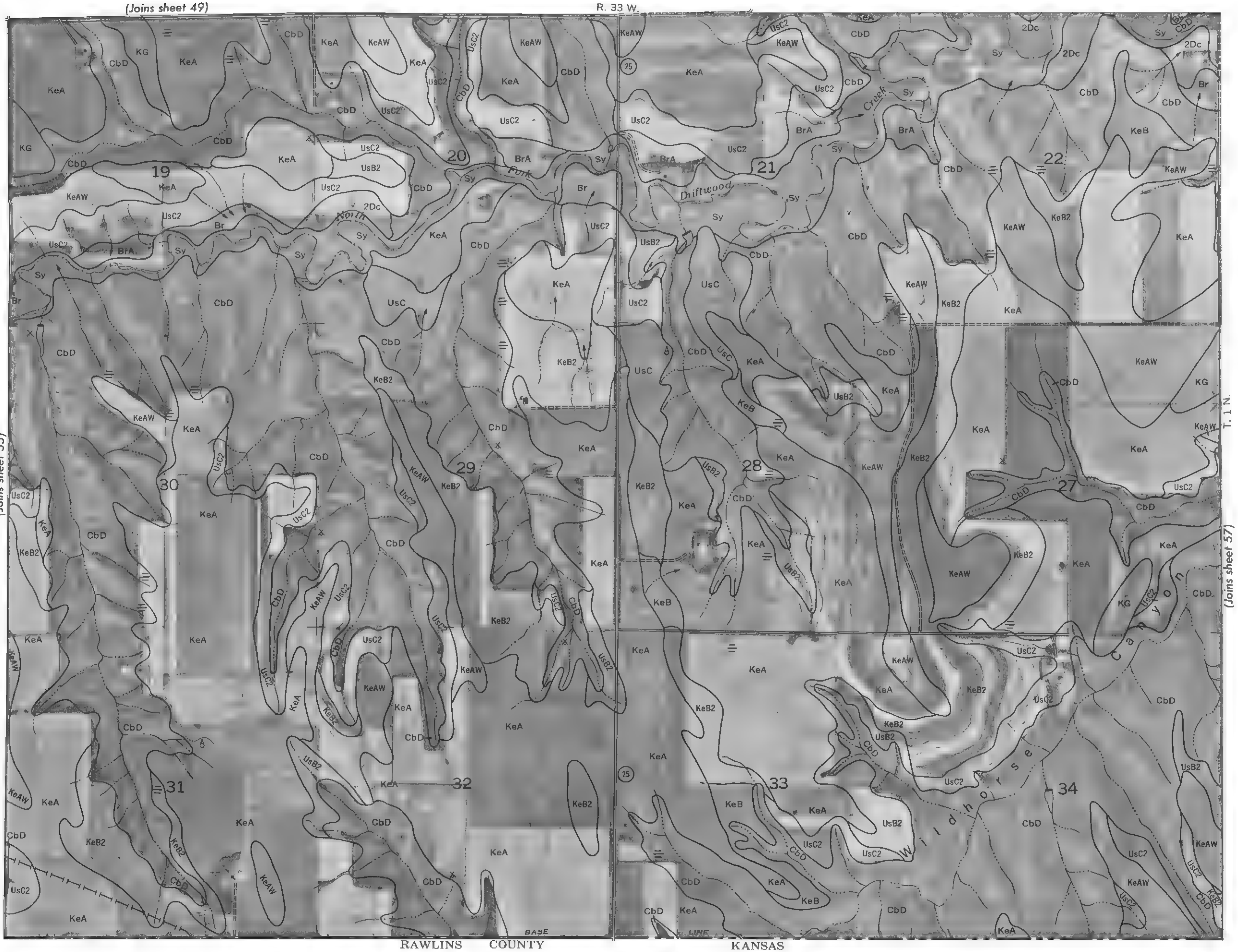
Land division corners are approximately positioned on this map.

0 ½ 1 Mile Scale 1: 20 000 0 5000 Feet

This map is one of a set compiled in 1967 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Nebraska, Conservation and Survey Division.

Land division corners are approximately positioned on this map.

HITCHCOCK COUNTY, NEBRASKA NO. 55



0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

HITCHCOCK COUNTY, NEBRASKA NO. 56

This map is one of a set compiled in 1967 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Nebraska, Conservation and Survey Division.

Land division corners are approximately positioned on this map.

0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

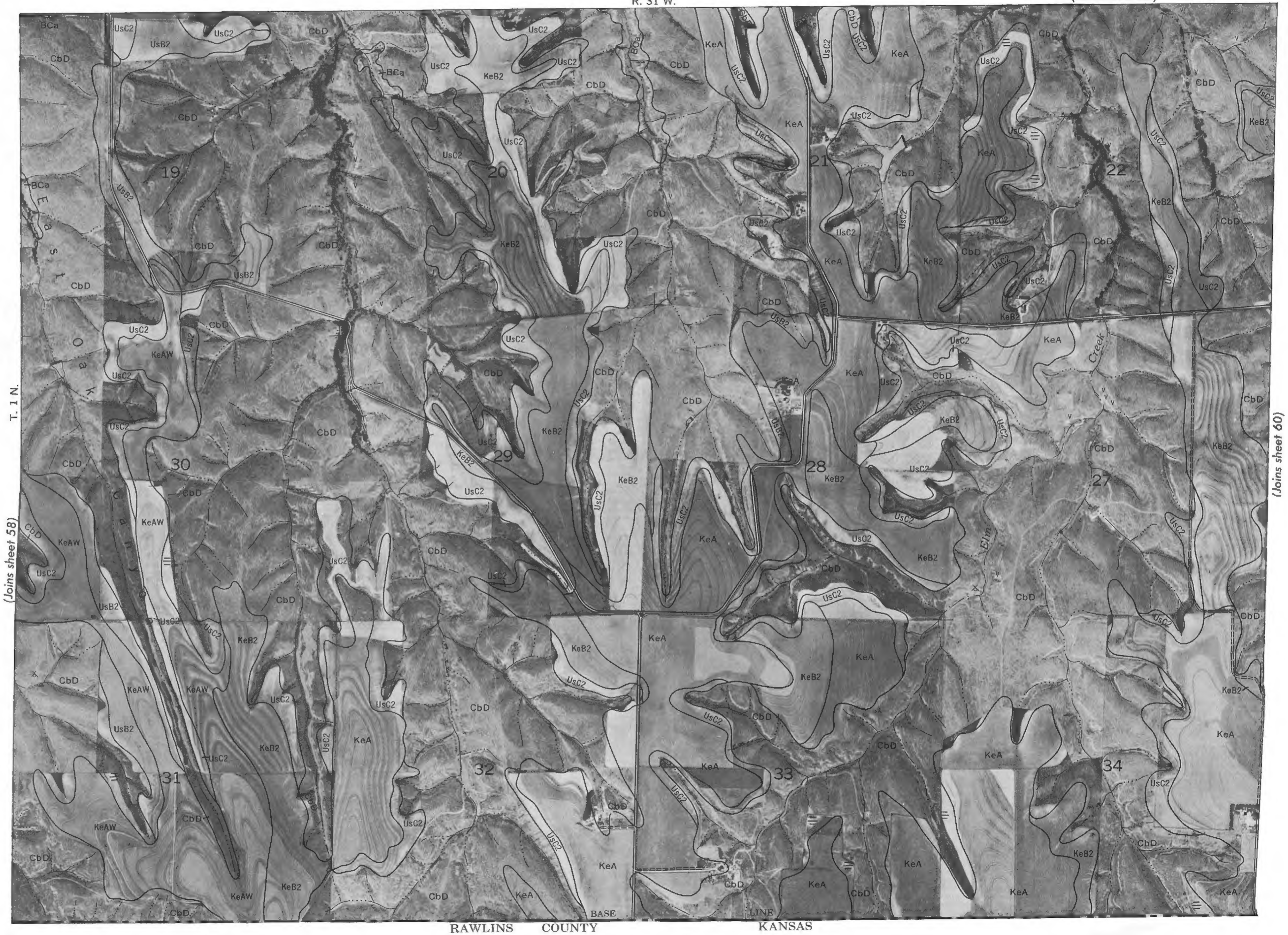
This map is one of a set compiled in 1967 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Nebraska, Conservation and Survey Division.
Land division corners are approximately positioned on this map.
HITCHCOCK COUNTY, NEBRASKA NO. 57

0 ½ 1 Mile Scale 1: 20 000 0 5000 Feet

HITCHCOCK COUNTY, NEBRASKA NO. 58

This map is one of a set compiled in 1967 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Nebraska, Conservation and Survey Division.

Land division corners are approximately positioned on this map.



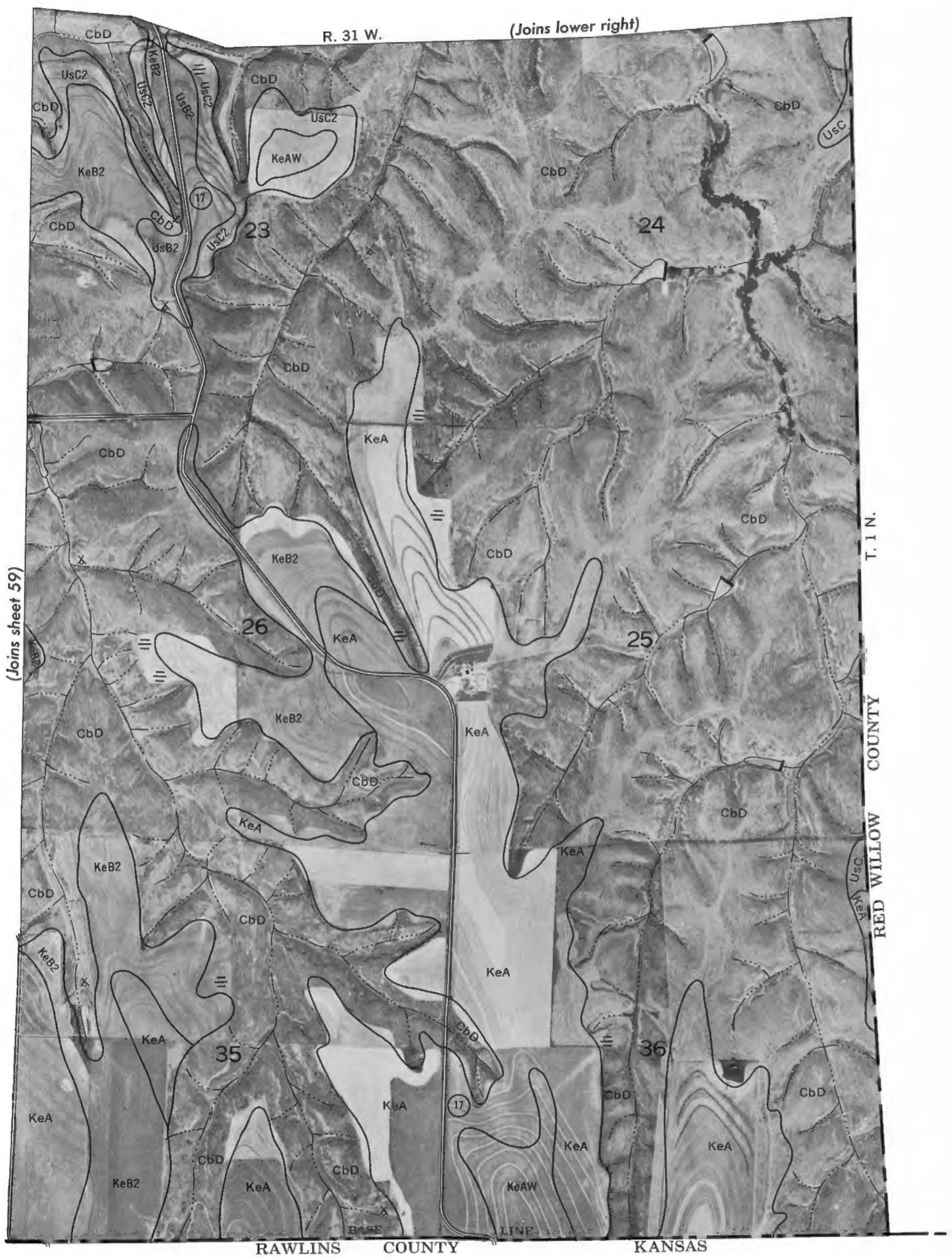
0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

This map is one of a set compiled in 1967 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Nebraska, Conservation and Survey Division.

Land division corners are approximately positioned on this map.

HITCHCOCK COUNTY, NEBRASKA NO. 59

60



0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

HITCHCOCK COUNTY, NEBRASKA NO. 60
This map is one of a set compiled in 1967 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Nebraska, Conservation and Survey Division.
Land division corners are approximately positioned on this map.